

# **Neck DVD Manual**

Welcome to the program on cervical pain and injuries. This manual will help you work through the DVD program and serve as a memory tool for the lesson. As you watch the DVDs, follow along the sections in this manual - take notes, highlight important information, mark the sections you want to return to. Use it in any way that will help you.

## **DVD #1 - Cervical Anatomy in Depth**

### **Pretest**

1. If resisted extension of the elbow is weak, what structure is injured?

Answer: \_\_\_\_\_

2. True or False: The majority of chronic cervical pain is caused by injuries to muscles in the neck.

Answer: \_\_\_\_\_

3. Pain down the medial border of the scapula is most commonly caused by injury to what structure?

Answer: \_\_\_\_\_

4. True or False: Whiplash describes a specific injury in the neck.

Answer: \_\_\_\_\_

5. Injuries to the neck occur most commonly at which level of the cervical spine?

Answer: \_\_\_\_\_

## **Anatomy of Relevant Structures**

### **Spinal Structure**

- ❖ Vertebrae
- ❖ Spinous & Transverse Processes
- ❖ Vertebral & Basilar Arteries
- ❖ Zygapophysial Joints
- ❖ Intervertebral Discs

#### **Vertebrae**

The vertebral bodies comprise the boney building blocks of the spine. They have two major functions. First, to bear the weight of the body, and second, to protect the spinal cord and nerves within the spinal canal. The vertebrae are stacked one on top of another with the intervertebral discs between them. Together, the vertebral bodies act as a support system to hold up the spine. The spine supports about half of the body's weight, with the other half supported by the muscles.

There are five major areas of the spine: cervical, thoracic, lumbar, sacral and coccygeal. The shape and function of the vertebrae differ slightly from area to area. The cervical region is the upper-most portion of the spine, and includes seven vertebrae. The top two vertebrae are unique. The first cervical vertebra (the atlas) is in the shape of a ring. It is the only vertebra in the spine that does not have a vertebral body. The second cervical vertebra (the axis) also has a unique shape. Extending upward from the body of the axis is a small, tooth-like, bony projection known as the odontoid process. It acts as a post that the atlas pivots around. At least 50% of the rotation in the neck occurs at this pivot joint.

Like the rest of the spine, the next five vertebrae have one disc and two pairs of zygapophysial joints, one superior and one inferior. Unlike the rest of the spine, the vertebrae in the cervical spine contain openings in each transverse process for the arteries to carry blood to the brain. The vertebral artery runs through the transverse foramen. When the circulation in these vertebral arteries is interfered with or compromised, many uncomfortable and dangerous symptoms can occur.

#### **Spinous Processes**

The spinous process is a broad, projection of bone at the back of a vertebra with two tuberosities to which muscles and ligaments are attached. They are often split, or bifid, in this region of the spine, allowing for a greater surface area for muscle and ligament attachments.

## **Transverse Processes**

The transverse processes are bony protrusions on either side of each vertebra. They are small and slender, but are larger and extend farther out from the midline than you might think. The cervical transverse processes, each with two tuberosities, provide attachment sites for many muscles and ligaments of the neck. The ligaments that attach the spinous and transverse processes to each other are the source of many chronic injuries in the neck region.

## **Vertebral and Basilar Arteries**

The vertebral arteries are key blood vessels that carry blood from the heart to the brain. These two arteries, one on each side of the body, run up the back of the neck and then join together inside the skull to form the basilar artery. The basilar artery, in turn, supplies blood to both the cerebrum and the cerebellum. The cerebrum is the largest portion of the brain. It controls and integrates motor, sensory, and higher mental functions, such as thought, memory, and emotion. The cerebellum is the second largest portion of the brain. It is located just above the brainstem at the base of the skull, and controls reflexes, balance, and certain aspects of movement and coordination.

## **Zygapophysial Joints**

The zygapophysial joints are often referred to as “facet joints.” Although this common name is easier to pronounce, it is anatomically incorrect. The word “facet” refers to the articular cartilage surface in many small joints throughout the body, such as the phalanges and costovertebral joints. Zygapophysial joints are true synovial joints. In addition to articular cartilage, they contain a joint capsule and a synovial membrane.

Each vertebra has two sets of zygapophysial joints - one for articulating with the vertebra above, and one with the vertebra below. In association with the spinal discs, these joints allow for movement between the individual vertebrae of the spine. The primary movements permitted by the zygapophysial joints are flexion and extension of the spine. Their joint capsules serve to limit side-flexion and rotation. Their capsular ligaments protect the posterior portions of the discs from excess flexion and torsion forces.

## **Intervertebral Discs**

The intervertebral discs make up one-fourth of the length of the spinal column. There are no discs between the atlas and the axis, or between the vertebrae that form the coccyx. Above and below each disc is a thin layer of cartilage, known as a vertebral end plate, which attaches the disc to the adjacent vertebrae. Because discs have no direct blood supply, their only sources of nourishment are the nutrients that diffuse across these end plates.

Intervertebral discs act as the spine's shock-absorbing system. They provide cushioning to protect the vertebrae, the brain, and the nerves. The discs also allow for motion in the spine.

Individual disc movement is very limited, but with their combined motion we can bend a considerable distance.

Intervertebral discs are composed of two parts: the annulus fibrosis and the nucleus pulposus. Both are made up of water, collagen, and proteoglycan (or PG) molecules.

The annulus fibrosis consists mainly of collagen fibers. These fibers are arranged in concentric sheets, forming a strong outer ring that connects to the vertebral end plates and encloses the nucleus pulposus. The nucleus pulposus consists mainly of PG molecules, which form a water-rich gel that resists compression. PG molecules are important because they attract and retain water, and a high water content is critical to proper disc functioning.

The amount of water in the nucleus gradually decreases throughout the day. This is because whenever we stand or sit, a gravitational compression force is exerted on the vertebrae. As a result of this compression, water diffuses from the discs into the vertebral bodies — making us a little shorter at the end of each day. While we sleep, the water diffuses back into the discs, and we awake at our normal height.

## **Nerves**

- ❖ Spinal Cord
- ❖ Spinal Nerves
- ❖ Nerve Roots
- ❖ Nerve Trunks

### **Spinal Cord**

The spinal cord consists of a bundle of nerves running down the central canal of the spine, from the brain to the lumbar region. The spinal cord actually ends at L1, or in some cases L2. After this point, the individual nerves continue without the cord covering them. They look a lot like a horse's tail, and so they are called the cauda equina, which means horse's tail in Latin.

All nerves going to the trunk and the extremities originate within the spinal cord. At each vertebra, small bundles of nerves branch off, transmitting nerve impulses to and from various parts of the body. Spinal cord injuries occur when a traumatic event causes damage to individual cells within the spinal cord or a complete rupture of nerves within the cord.

### **Spinal Nerves**

Nerves are the body's communication system. The spinal nerves carry messages from the brain through the spinal cord to the rest of the body. There are eight pairs of spinal nerves in the cervical region. Most of these cervical nerves exit the spine above the vertebra they are named for. The one exception is the C8 nerve, which exits below the C7 vertebra and above T1.

As these nerves exit the spine, they travel through small openings between the vertebrae, which are called the intervertebral foramen. Then they branch off into motor nerves (which control our movement) and sensory nerves (which communicate the sensations we feel). The nerves in different areas of the spinal cord connect to different parts of the body. The nerves of the cervical spine go to the upper back, upper chest, arms, and hands. The nerves of the thoracic spine go to the lower chest and abdomen. And the nerves of the lumbar spine go to the pelvis and legs. Whenever your body gets hurt in some way, your nerves signal the brain about the injury. Damage to the nerves themselves can cause pain, tingling, numbness, or weakness.

## **Nerve Roots**

The nerve root is the first half-inch or so of a nerve as it exits the spinal cord. It's enclosed in a tapering sleeve of dura mater, the tough fibrous membrane that encases the spinal cord. This is the portion of the nerve that commonly causes pain when compressed by a protruding disc.

## **Nerve Trunks**

The nerve trunk is the portion of a nerve that extends beyond the dural sleeve. It begins about a half-inch from the spinal cord. Pressure on a nerve trunk causes no pain, only distal paresthesia, which is the sensation of pins-and-needles. The paresthesia occurs in the area of the body that receives signals from that nerve. The location of the paresthesia will tell you which nerve is affected, but will not tell you where on the nerve the pressure is occurring. This is because pressure exerted at any point along the nerve trunk will cause roughly the same symptoms.

## **Ligaments**

Now let's take a look at the ligaments in the neck. These fall into four major categories:

- ❖ Nuchal Ligament
- ❖ Supraspinous Ligaments
- ❖ Interspinous Ligament
- ❖ Intertransverse Ligament
- ❖ Supraspinous Ligaments

## **Supraspinous Ligaments**

The supraspinous ligaments, sometimes referred to as the supraspinal ligaments in the literature, run from the tip of one spinous process to the next, attaching the cervical vertebrae to one another. You can easily palpate these ligaments both on the posterior surface of the spinous processes and in-between the spinous processes. Together, they function as one continuous structure, yet with individual segments that can each sustain an injury. The supraspinous ligaments continue all the way down the spine to the sacrum. At the top of the spine, the supraspinous ligaments are interwoven with fibers of the nuchal ligament.

## **Nuchal Ligament**

The nuchal ligament, often referred to as the ligamentum nuchae, is a broad, fibrous, roughly triangular tissue at the center of the back of the neck. It goes from the external occipital protuberance, along the tips of the spinous processes of the cervical vertebrae, down to the tip of the C7 spinous process.

## **Interspinous Ligaments**

The interspinous ligaments lie deep to the supraspinous ligaments. They comprise the next layer of ligament tissue, attaching the deeper surfaces of the spinous processes to each other. These ligaments run from the base of one spinous process-to-another and can be one to two inches in depth, depending upon the size of the person. Because they are so deep, they cannot be directly treated manually.

## **Intertransverse Ligaments**

The intertransverse ligaments attach adjacent transverse processes to one another. Their function is to provide support and to limit side-flexion and rotation. They are often the cause of severe and persistent neck, head, and upper back pain. These ligaments are located fairly superficially and can be palpated with some practice.

## **Muscles**

- ❖ Sternocleidomastoids
- ❖ Trapezius
- ❖ Occipitofrontalis Muscle
- ❖ Suboccipitals
- ❖ Scalenes
- ❖ Splenius Capitus & Splenius Cervicis
- ❖ Levator Scapula Muscles

## **Sternocleidomastoids**

The sternocleidomastoid muscles divide both sides of the neck into anterior and posterior triangles. They originate from two heads. The sternal head begins at the anterior surface of manubrium (the upper part of the sternum). The clavicular head originates at the superior surface of the medial third of the clavicle. As they move diagonally up the neck, these muscles insert primarily at the mastoid process portion of the temporal bone. They are the primary movers in head rotation, and they also assist in side-flexion and extension of the neck.

## **Trapezius**

The trapezius is the large superficial muscle of the neck and upper back. It is named for the geometrical shape it resembles: the trapezium, or trapezoid. The trapezius has many attachments and performs multiple actions. Its attachments extend from the occipital protuberance down the nuchal ligament to the spinous process at C7 and all the way down to T12. It inserts into the lateral third of the clavicle and the acromion process, and also into the spine of the scapula. Its muscle fibers at the neck run downward and laterally toward the arm, and the fibers from the vertebrae run upward and toward the shoulder.

The trapezius muscle elevates, retracts, adducts, and rotates the scapula. The superior fibers elevate the scapula, the middle fibers retract it, and the inferior fibers depress it. When the superior and inferior fibers work together, they rotate the scapula.

## **Occipitofrontalis Muscle**

The superficial occipital muscles at the back of the skull are part of the occipitofrontalis muscle. The frontalis part of this muscle of the forehead attaches to the epicranial aponeurosis which covers the skull. This is a fascial sheet that covers the head and connects these two parts of this unique structure. The occipital muscle attaches at the other end of this aponeurosis to the occipital bones. These, along with the suboccipital muscles, are very important components of working with neck pain and neck injuries.

## **Suboccipitals**

There are four suboccipital muscles, the rectus capitis posterior major and minor, and the oblique capitis inferior and superior. These muscles are attached to the occipital bones, the atlas, and the axis, and they assist in rotation and side-flexion of the head. The suboccipitals are often injured and are frequently implicated in neck pain and headaches.

## **Scalenes**

The scalene muscles are located on each side of the neck, attaching to the upper transverse processes and the first two ribs. Studies have found that their configuration can vary greatly from person to person. The scalenes side-flex the neck and assist in rotation. They also assist in breathing by raising or fixing the first two ribs.

## **Splenius Capitis & Splenius Cervicis**

The splenius capitis and splenius cervicis are the powerful muscles at the back of your neck. They extend and rotate the head. When the neck is tense, these muscle are often in chronic contraction. The splenius capitis muscles are attached at the lower portion of the nuchal ligament, the spines of the C7 vertebra, and the first three thoracic vertebrae. They insert at the mastoid process and the occipital bone. The splenius cervicis muscles originate at the spinous

processes of T3 to T6 and insert at the transverse processes of C1 to C3.

### **Levator Scapula Muscles**

The levator scapula muscle originates at the transverse processes of the upper three or four cervical vertebrae and attaches at the superior aspect of the medial border of the scapula. Its primary function is to raise the shoulders. Pain felt in the region of the levator scapula, at the medial border of the scapula, is relatively common. However, such pain typically does not mean that this muscle is injured.

## **Anatomy Drawing**

- ❖ Occipital Protuberance
- ❖ Mastoid Processes
- ❖ Occiput
- ❖ Spinous Processes: C7, C6, C5, C4, C3, C2, C1
- ❖ Transverse Processes: TP7, TP6, TP5, TP4, TP3, TP2, TP1
- ❖ Thoracic Vertebrae
- ❖ Clavicle
  
- ❖ Supraspinous Ligaments
- ❖ Nuchal Ligament
- ❖ Interspinous Ligaments
- ❖ Intertransverse Ligaments
  
- ❖ Trapezius Muscle
- ❖ Splenius Capitis Muscle
- ❖ Splenius Cervicis Muscle
- ❖ Occipital Muscles
- ❖ Occipitofrontalis Muscle
- ❖ Suboccipitals
- ❖ Sternocleidomastoid Muscle
- ❖ Scalenes (Scalenus Anterior, Scalenus Medius, Scalenus Posterior)

## **Anatomy Palpation**

- ❖ Spinous Processes: C7, C6, C5, C4, C3, C2, C1
- ❖ Supraspinous Ligaments
- ❖ Nuchal Ligament
- ❖ Occipital Protuberance
- ❖ Mastoid Processes
- ❖ Transverse Processes: TP7, TP6, TP5, TP4, TP3, TP2, TP1
- ❖ Trapezius Muscle
- ❖ Sternocleidomastoid Muscle
- ❖ Clavicle
- ❖ Erector Spinae
- ❖ Occipital Muscles
- ❖ Suboccipitals

## **DVD #2 – Assessment Tools**

### **Assessment Tests**

Assessment is a systematic method of gathering information to help you make the best possible decisions. Diagnosis is assigning a name or label to a certain group of pain phenomena or other symptoms. When you assign a name to a pain condition, you have given a diagnosis. Gathering information about someone's condition to determine how best to proceed or whether you should proceed is assessment, not diagnosis.

#### **Indicators**

- ❖ Pain
- ❖ Limitation of Movement
- ❖ Weakness
- ❖ Unusual Sensations or Loss of Sensation
- ❖ End Feel
- ❖ Abnormal Reflexes

#### **General Principles**

- ❖ Watch the Client's Face
- ❖ Normalize the Pain
- ❖ Be Careful When Testing in Extension
- ❖ Take Up the Slack and Jerk Lightly
- ❖ Go Gently at First
- ❖ Ask "Does it hurt? If so, where?"

#### **Testing Principles**

- ❖ Movements that Create Pain
- ❖ Locations of Referred Pain
- ❖ Range of Motion
- ❖ Weakness
- ❖ Unusual Sensations or Loss of Sensation
- ❖ Reflex Abnormalities

## **Assessment Tests**

### **Neck Tests - Soft Tissue**

Pain and Limitation:

1. Active Rotation Right
2. Active Rotation Left
3. Active Side Flexion Right
4. Active Side Flexion Left
5. Active Flexion
6. Active Extension
7. Passive Rotation Right
8. Passive Rotation Left
9. Passive Side Flexion Right
10. Passive Side Flexion Left
11. Passive Flexion
12. Passive Extension

### **Neck Tests—Neurological**

Weakness:

13. Resisted Rotation Right
14. Resisted Rotation Left
15. Resisted Side Flexion Right
16. Resisted Side Flexion Left
17. Resisted Flexion
18. Resisted Extension
  
19. Resisted Shoulder Raises
20. Resisted Abduction
21. Resisted Adduction
22. Resisted Lateral Rotation
23. Resisted Medial Rotation
24. Resisted Flexion
25. Resisted Extension
  
26. Resisted Wrist Extension
27. Resisted Wrist Flexion
28. Resisted Radial Deviation
29. Resisted Ulnar Deviation of the Wrist
30. Resisted Extension of the Thumb

- 31. Resisted Adduction of the Thumb
- 32. Resisted Adduction of the 4th and 5th Digits

Quality of Reflex:

- 33. Brachioradialis Jerk
- 34. Biceps Jerk
- 35. Triceps Jerk

Cord Pressure:

- 36. Knee Jerk
- 37. Ankle Jerk
- 38. Babinski
- 39. Ankle Clonus (presence or absence of “beats”)
- 40. Knee Clonus

Pain:

- 41. Ligament Palpation

**Neck Tests**

- 1-2. Active Rotations (ability to move, range of motion)
- 3-4. Active Side Flexions (ability to move, range of motion)
- 5-6. Active Flexion/Extension (ability to move, range of motion)
- 7-8. Passive Rotations (ligaments and discs)
- 9-10. Passive Side Flexions (ligaments and discs)
- 11-12. Passive Flexion/Extension (ligaments and discs)
- 13-14. Resisted Rotations (SCM, other rotator muscles of the neck)
- 15-16. Resisted Side Flexions (scalene muscles of the neck)
- 17-18. Resisted Flexion/Extension (suboccipital and erector spinae muscles)
- 19. Resisted Shoulder Raises (C2,3,4)
- 20. Resisted Adduction (C7)
- 21. Resisted Abduction (C5)
- 22. Resisted Lateral Rotation (C5)
- 23. Resisted Medial Rotation (C5)
- 24. Resisted Flexion (biceps C5,6; brachialis C6)
- 25. Resisted Extension (C7)
- 26. Resisted Wrist Extension (C6)
- 27. Resisted Wrist Flexion (C7)
- 28. Resisted Radial Deviation (C7)
- 29. Resisted Ulnar Deviation/Wrist (C8)
- 30. Resisted Extension/Thumb (C8)

31. Resisted Adduction/Thumb (C8)
32. Resisted Adduction of 4th & 5th Digits (T1)
33. Brachioradialis Jerk (C6)
34. Biceps Jerk (C5,6)
35. Triceps Jerk (C7)
36. Knee Jerk (spinal cord pressure)
37. Ankle Jerk (spinal cord pressure)
38. Babinski (spinal cord pressure)
39. Ankle Clonus (spinal cord pressure)
40. Knee Clonus (spinal cord pressure)
41. Ligament Palpation (supraspinous, intertransverse and pelvic ligaments)

#### Palpation of the Supraspinous Ligament:

For the ligament palpation, just do one or two friction strokes through the supraspinous ligaments at each level starting at C7 and going up to the occipital protuberance.

#### Palpation of the Intertransverse Ligament:

Then, perform one or two friction strokes on each of the intertransverse ligaments beginning at TP7 and going up to TP1, just inferior to the mastoid process.

#### Palpation of the Sub-occipital Muscles:

Perform a brief friction stroke at the base of the occiput, beginning about an inch lateral to the edge of the occipital protuberance and work your way laterally across the base of the occiput on both the right and left sides.

## Neck Test Descriptions

### 1–2. Active Rotations

Ask the client to rotate their head as far as possible to the right, and then to the left. After each test, ask if there is pain. Note whether there is limitation of movement; normal range is 90 degrees in each direction.



### 3–4. Active Side Flexion

Ask the client to tilt their ear toward their shoulder (while not raising the shoulder). Note any limitation and ask whether there is pain.



### 5. Active Flexion

Ask the client to drop their chin gently toward their chest, looking down toward the floor and touching chin to chest if possible. (In addition to any pain, note whether the client's chin touched the chest; this is normal range.)



### 6. Active Extension

Ask the client to look up at the ceiling, tilting the head as far back as possible without pain. A full range of motion is a 90-degree tilt, ending with the face parallel to the ceiling. (Note that many people tend to look up at the ceiling by moving only their eyes. If your client does this, ask them to try to look up further, stopping only if there is pain or discomfort.)



### 7-8. Passive Rotation

Stand at the person's right side and ask the client to turn their head to the right. Place your left forearm on the left scapula to stabilize the upper body, and place left your palm on the side of the head, with your fingers around the ear but not covering it. Then place your right hand on the client's left cheek and gently rotate the neck to the end of range, taking up all the slack. Stop if there is any pain or discomfort. If there is absolutely no discomfort, give a very gentle jerk/overpressure (a slight motion, moving through less than a half-inch of space). Note any limitation of movement and the location of any pain. Now repeat the test on the other side.



### 9-10. Passive Side Flexion

Stand behind the client and ask them to tilt their head to the right, trying to bring the ear to the shoulder. Place your left hand on the left shoulder and your right hand on the left side of the head above the ear. Stretch to the end of range. If there is no pain, give a slight jerk. Note whether there is limitation, and note the location of any pain. Now repeat on the other side. If there is only a slight stretching sensation and it is the same on both sides, the test result is negative.



### 11. Passive Flexion

Ask the client to lower the chin toward the chest, with the weight of the head hanging down. If there is no pain, place your middle and index fingers on the back of the head and gently stretch it further. If there is still no pain, give a very slight jerk, using only two fingers to ensure that you do it gently. In most individuals under 40, the chin should reach the chest.



### 12. Passive Extension

Ask the client to look up at the ceiling, extending the neck as far as possible by him- or herself. If there is no pain, place one or two fingers on the forehead and the other hand on the upper back for support. Gently press the head into further extension, and if there is still no pain, give an added gentle jerk. Take note of any pain or limitation.



### 13–14. Resisted Rotations (C1 and C2)

Stand behind the client and place one hand on each side of the head, just above the ears at the temples. Hold your hands firmly in place and ask the client to try to turn the head forcefully to the right, while you prevent it from moving. If the person is quite strong, you may have to slide your right hand slightly forward for better leverage. Repeat the test with the client turning to the left.



### 15-16. Resisted Side Flexion

Place your right hand on the client's right shoulder to stabilize the upper body, and place your left hand on the left side of the head, just above the ear. Then ask the client to bring the head toward the left shoulder as you resist the movement isometrically. Repeat on the other side.



### 17. Resisted Flexion

Place one hand on the client's upper back for stabilization, and place your other hand on the forehead. Now ask the client to forcefully try to lower the head toward the chest. As the client presses the head down, offer resistance with your hand to make sure it doesn't move.



### 18. Resisted Extension

Standing at the client's side, place one hand on the upper chest and the other hand on the back of the head. Now ask the client to push the head backward into your hand as you offer resistance, preventing any movement.



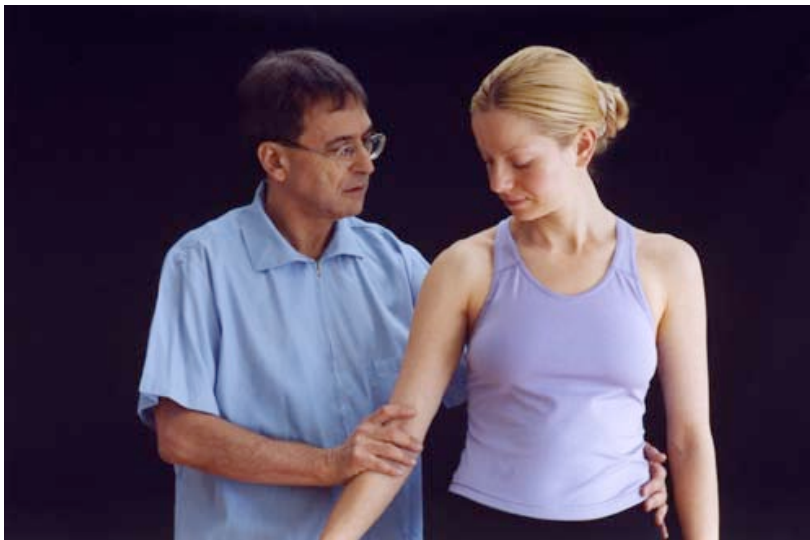
#### 19. Resisted Shoulder Raise (C2, C3, C4)

Stand behind the client. Ask her to raise the shoulders and hold them steady. Place one hand on top of each shoulder and try to force the shoulders down as the client tries to keep her shoulders up.



#### 20. Resisted Abduction (C5)

Place one hand on the outside of the client's elbow and the other hand around the waist on the opposite side of the body to stabilize the trunk. Now, ask the client to press out forcefully as you hold the arm near her side.



### 21. Resisted adduction (C7)

Hold one of the client's arms by the wrist about one foot away from the side of her torso, with the elbow straight. Place your other hand or fist on the client's nearest hip bone to stabilize her. Now, ask her to pull the arm in toward the body.



### 22. Resisted lateral rotation (C5)

Place one hand on the client's upper arm just above the elbow and press the upper arm into the body to stabilize it. With the client's forearm bent at a right angle and extending forward from the trunk, place your other hand on the outside of her wrist. Now, ask her to push outward toward you while you resist the push. This test is done at 90° (the angle of the arm and the trunk, not the angle of the elbow) first, but may also be done at 30° and 135° for more precise testing.



### 23. Resisted Medial Rotation (C5)

Starting from the same position as in the previous test, place your fingers on the inner portion of the wrist with the client's arm bent at a 90° angle and in front of her. Now, ask the client to pull the wrist toward the stomach while you pull outward. Be sure to keep her upper arm against her body to stabilize the shoulder.



### 24. Resisted Flexion (C5 and C6)

There is less need to stabilize in this test and the following test. Starting from the same position as in the last two tests, place one or both hands above the wrist and ask the subject to push up while you push down.



### 25. Resisted Extension (C7)

Place one or both of your hands under the client's wrist as she holds the arm in the same position as in the last three tests. Now, ask her to push down forcefully as you resist.



### 26. Resisted Wrist Extension (C6)

Ask the client to hold her arm out in front of her, extending the hand as if she were a traffic cop saying "Stop." Place one of your hands under the client's wrist to support it and wrap the fingers of your other hand around the back of her hand just below the fingers. Now, ask the client to hold the hand position while you try to pull the hand forward.



### 27. Resisted Wrist Flexion (C7)

Ask the client to hold the arm out in front of her, flexing the hand (or fist) downward. Place one of your hands over her wrist to support it and wrap the fingers of your other hand under her fist. Now, ask the client to hold the hand position while you try to pull the hand forward.



### 28. Resisted Radial Deviation (C7)

Ask the client to hold the arm out in front of her, radially deviate the wrist with the palm down, and hold it there. Now, grasp the lateral part of her forearm with your lateral hand and grasp the thumb side of her hand with your other hand. Try to forcefully move her hand laterally as she resists you.



### 29. Resisted Ulnar Deviation of the Wrist (C8)

Stand in front of the client and ask her to hold her hand in front of her, palm down. Now, grasp the medial part of her forearm with one hand to stabilize the arm and grasp the lateral portion of her hand with your other hand. Ask her to side flex her wrist (ulnar deviation) and hold it there. Now, forcefully try to bring her wrist medially as she resists you.



### 30. Resisted Extension of the Thumb (C8)

Ask the client to extend her hand as if she were going to shake your hand. Now, ask her to her thumb up as you grasp it with your thumb and try to press it down. Wrap your thumb around the most distal joint; don't press down at the tip of the thumb.



### 31. Resisted Adduction of the Thumb (C8)

Ask the client to hold her hand in front of her, palm down, with the fingers and thumb together. Now, grasp her thumb between your thumb and index fingers and hold the lateral part of her hand with your other hand to stabilize it as you try to pull her thumb away from her index finger.



### 32. Resisted Adduction of the 4<sup>th</sup> and 5<sup>th</sup> Digits (T1)

Ask the client to hold her hand in front of her, and place one of your fingers between her 4<sup>th</sup> and 5<sup>th</sup> digits. Now ask her to squeeze your finger by drawing her fingers together, with the palm still facing the floor.



### 33. Brachioradialis Jerk (C6)

Stand facing the client and cradle her left forearm with your left hand, supporting the client's elbow with the palm of your left hand. Now, holding a reflex hammer in your right hand, hit the brachioradialis muscle to test the reflex.



### 34. Biceps Jerk (C5 and C6)

Stand facing the client and cradle her left forearm with your left hand, supporting the client's elbow with the palm of your left hand. Now, place your left thumb on the client's biceps tendon as it crosses the elbow joint. Holding the reflex hammer in your right hand, hit your own thumb between your 1<sup>st</sup> and 2<sup>nd</sup> thumb joints and look for the reflex.



### 35. Triceps Jerk (C7)

Stand facing the client and cradle her left forearm with your left hand, supporting the client's elbow with the palm of your left hand. Now, place your left thumb on the client's biceps tendon as it crosses the elbow joint. Holding the reflex hammer in your right hand, hit the triceps muscle a few inches above the elbow and look for the reflex.



### 36. Knee Jerk

With the client lying on the table and you standing at his right side, place your left hand under the left knee and bend the leg about 30 degrees. Make sure he's relaxed. Holding the reflex hammer in your right hand, strike the patella tendon below the kneecap and watch for the reflex. Now, reach across to the other knee and repeat, remaining on the same side of the table. If you're left-handed, do the entire test from the other side of the table.



### 37. Ankle Jerk

With the client lying supine on the table, stand at the foot of the table and gently place her foot in passive dorsiflexion (be sure she's not holding her foot in that position). With the reflex hammer in your free hand, strike the Achilles tendon forcefully and watch for the reflex. Repeat on the other side; you can use the same hand position if you position yourself slightly differently.



### 38. Babinski

With the client lying on his back, place one hand over the ankle to hold it in place. Place the handle end of your reflex hammer or a fingernail on the bottom of the foot, just in front of the heel. Now, with moderate force, scrape the sole of the foot and watch for the big toe to turn down. A positive test will show the big toe curl into dorsiflexion; this indicates cord pressure.



### 39. Ankle Clonus

Stand at the side of the client's feet. Place one hand above the ankle and press it gently into the table. Now, place your other hand on the ball of her foot and forcefully push it into dorsiflexion. Count the number of involuntary beats. One or two are fine; three means spinal cord pressure. Repeat on the other ankle.



### 40. Knee Clonus

The client lies supine. Place your hand above the knee, grasping the lowest portion of the thigh with your thumb and forefingers. Your hand should be facing her foot. Keeping your hand relaxed, suddenly grip and press simultaneously downwards and footward, and watch for the involuntary beats of the kneecap.



#### 41. Ligament Palpation

With the client lying on her back and you sitting at the head of the table, run the tip of your finger across each ligament in succession (nuchal, then intertransverse) to check for tenderness.

##### Palpation of the Supraspinous Ligament:

For the ligament palpation, just do one or two friction strokes through the supraspinous ligaments at each level starting at C7 and going up to the occipital protuberance.

##### Palpation of the Intertransverse Ligament:

Then, perform one or two friction strokes on each of the intertransverse ligaments beginning at TP7 and going up to TP1, just inferior to the mastoid process.

##### Palpation of the Sub-occipital Muscles:

Perform a brief friction stroke at the base of the occiput, beginning about an inch lateral to the edge of the occipital protuberance and work your way laterally across the base of the occiput on both the right and left sides.

## **Subtleties in Testing**

### **Neck or Scapula Pain on Resisted Abduction or Other Resisted Tests**

When we do resisted abduction, we're testing for weakness caused by a C5 nerve root compression. This test should not produce pain in the neck or shoulder area, but occasionally it does. This can cause confusion for practitioners. Keep in mind that whenever we test any muscle, as many as 20 or 30 other muscles may come into play to stabilize the body. When clients perform resisted abduction, they'll be using the muscles of the head, neck, trunk, and legs to stabilize themselves. Sometimes in the act of stabilizing they put undue pressure on another structure, which causes pain.

### **Side-Flexion Tests**

When side-flexion is performed on a normal neck, there is often a pleasant feeling of stretch. This is quite different from an uncomfortable or painful stretching sensation. Sometimes clients are not sure which type of stretch they're feeling — especially when they have been in pain for some time. It is often useful to compare side-flexion to the right and left to see if one is pleasant and one is uncomfortable. This will help you determine whether the test result is positive or negative.

### **Pain on Rotation - Level by Level**

If you perform the rotation tests with the head in slight flexion, you are putting more stress on the ligaments of C1 through C3. If you perform the rotation tests with the head in the normal anatomical position, the greatest stress is placed on C4 and C5. If you perform the rotation tests with the head in slight extension, you are putting more stress on the ligaments of C5 through C7.

### **Weakness at Most or All Levels is Just Disuse/General Dysfunction**

Remember the distinction between specific weakness, which is caused by a disc lesion, and generalized weakness, which is caused by disuse. Most people who are in a great deal of neck pain restrict their movement and stop exercising because it exacerbates their pain. If you don't use a muscle for two weeks, you lose 25% of its strength. If you don't use a muscle for three months, you may lose 50% of its strength. So if weakness is just in one segment (indicating a disc lesion), tests associated with one specific nerve will show weakness, and the other test results will be normal. If all the tests indicate weakness, this may be because the person has not exercised or used his or her body normally for quite some time.

## **If You See Fear During the Assessment Exam, Be Very Careful**

Many clients have had the experience of being tested by a health care practitioner only to go home with increased pain for several days. In addition, individuals with severe neck injuries will avoid certain movements because somewhere inside they know that movement would be very, very painful. This fear comes up frequently in neck testing when you ask clients to look at the ceiling or rotate the head to one side. I always tell clients to let me know immediately if they become afraid when I ask them to do something during the assessment process. If I see that kind of fear when I ask a person to look up at the ceiling, I often skip that test and go on to the next one, marking it in my mind as a positive test finding. If I feel it's really important to do the test, I might do it with the person lying down and only moving a quarter of an inch at a time. Whenever you see fear during your assessment testing, go slowly, be very careful, and ask your client about any apprehension they might be feeling.

## **Mid-Back Pain on Flexion**

If neck flexion causes pain in the mid-back, it could be for at least two reasons. It could be a referred pain from the neck to the mid-back, which is quite common. However, it could also indicate an injury to the ligaments in the thoracic spine. Here is a quick test for injury to the thoracic ligaments. Have the client sit on the edge of a stool or chair with their legs together and their arms folded over their chest. Tell the person that you are going to lock their knees with your knees to stabilize them during the test. Now gently grasp both shoulders and rotate the thoracic spine in both directions. When there is a thoracic ligament injury, this test causes pain in the thoracic region. There's also an alternative way to do this test, which is especially good for people who are shorter than their clients. Have the client sit on the table. Stand to the client's side, pressing your lateral thigh against the side of their lateral knee, and rotate the thoracic spine to that side. Then walk around and repeat this on the other side.

## **Shooting Pain at the Back of the Eye or Pain in the Teeth**

Whenever anyone has pain — especially shooting pain — in the eye region, send that person to an eye doctor immediately. Likewise, when there is pain in the teeth or gums, be sure the client has checked with a dentist to make certain there is not a dental problem. Pain in both of these locations can also be caused by strains of cervical supraspinous or intertransverse ligaments. A ligament lesion at C2 can cause shooting pain at the back of the eye, and a lesion at C5 can cause pain in the teeth. This can often be verified with your hands. If a C2 ligament is to blame for a client's eye pain, performing cross-fiber friction on that structure will re-create the pain. Similarly, performing cross-fiber friction on a C5 ligament may re-create a client's tooth pain.

## **Dizziness and Altered Vision**

Some clients with neck pain will exhibit dizziness, or altered vision especially when looking up. Any client with such a symptom should see a physician soon. It may indicate compression of one of the vertebral arteries as it moves toward the basilar artery and the brain. Distortions in neck alignment can be a major contributor to diminished circulation in the vertebral arteries.

## **Extreme Pain And/Or Limitation of Movement in Neck Flexion or Extension**

If a client has extreme pain and/or limitation of movement in neck flexion or extension, be sure to have the person see a physician before you attempt to treat them. These symptoms can indicate a very serious condition, such as pressure on the spinal cord. Slight cord pressure can develop over time even without an accident, and any amount of cord pressure can cause movement to be severely limited. Ligaments of the neck may loosen and stretch over time, allowing the disc matter to protrude posteriorly — which affects the function of the spinal cord. If the spinal cord is being compressed, there will be more than three beats of clonus in the foot and possibly the knee, and the Babinski test will be positive, the great toe will curl up into extension. Extreme pain on neck flexion or extension may also be caused by a very superficial but severe ligament injury. This may occur in a supraspinatus ligament anywhere from C4 to C7, but is more likely to be a strain of the intertransverse ligament at C7.

## **Taking a Cervical History**

The history not only gives you an indication of what may be injured, what caused the injury, and how severe it is, but also provides some insight into who this person is and how they must be treated for the therapy to be as effective as possible.

### **Why are you here?**

There may be one reason the person has come to see you or there may be several. People will often tell you only their most pressing concern and leave out the others.

### **Are there any other areas of pain in your body?**

This gives the client an opening to tell you about any other secondary issues of concern. These may or may not be related to the neck pain. Frequently the person does not give you all of the relevant information at this point.

### **Have you seen a physician about this problem?**

This is a very important question. When clients have not already seen a doctor for their pain problem, I always send them to one. Particularly for a client with cervical pain, there are a number of serious medical issues to be considered that are beyond the knowledge base and scope of practice of a massage therapist or body worker. Cervical pain is also often associated with headache pain, which is a symptom of several different diseases. To practice safely and responsibly, have every client see a doctor. If you have a professional relationship with a particular physician that you can talk with, that's even better.

### **If yes, what was the diagnosis?**

Getting a working diagnosis from a physician protects both you and the client. You can assess what you think is happening in order to guide what you do in your treatment sessions, but you cannot offer a diagnosis. Only a doctor can legally do that.

In many cases, the client will have had a radiological test such as an X-ray or an MRI. In reality, most common injuries will NOT be detected by these tests. However, there are several conditions in the cervical region that can be observed on a radiological test. These include:

- ❖ Disc erosion
- ❖ Fractures of the lumbar vertebrae
- ❖ The formation of an osteophyte, or bone spur
- ❖ An abnormal curve of the cervical spine
- ❖ A misalignment of the vertebral joints

**How old are you?**

Different cervical conditions are associated with different age groups.

**What do you do for a living?**

Here you are looking for clues as to possible causes of pain or reasons why the pain has not abated. For example, a computer programmer, typist, dentist, or house painter may perform repetitive actions that help explain why the injury occurred or why it has not gotten better.

**What do you eat for breakfast, lunch, and dinner?****What do you snack on?****Do you drink coffee or eat sweets on a daily basis?**

A person's diet has a strong impact on their overall health and their ability to heal efficiently. Clients with poor dietary habits may benefit greatly from seeing a health professional who specializes in nutrition.

**How much water do you drink each day?**

A person who does not drink an adequate amount of water may be dehydrated without even knowing it. Often, people who are dehydrated have lost a sense of thirst and don't feel thirsty. Each person's need for water is different, but the average is 6-8 glasses of water per day. Soup, juice, lemonade, soda, tea, and coffee don't count as water.

**Do you exercise regularly? If yes, how frequently?****What types of exercise do you do?**

If a person does not exercise, find out why. Is it because of the pain they're in? If the client never exercised regularly, this person needs some education about how to stay healthy. If the client over-exercises and continually gets hurt, the person needs to learn how to exercise within the body's limits.

**When did your pain first occur?**

Did the pain come and then go away and return at a later date? Or the frequency of painful episodes might have increased over time. Different injuries are associated with different time lines.

**Was your pain precipitated by an accident?  
If so, describe the accident.**

The type of accident gives you another piece of important information. If it was a motor vehicle accident, the type of impact will often explain the type of injury the client has.

**Did the pain come on slowly or suddenly?**

The onset of pain gives you information about causation. When a pain comes on suddenly, it is usually associated with a specific incident. When it comes on slowly, it may have more to do with wear and tear, poor alignment, faulty movement habits, or misuse of the body during sports or a work activity. In some cases, a series of mini-traumas gradually increase the person's vulnerability over time, and then one specific incident acts as the final straw that brings on the pain.

**Where is your pain exactly?**

Have the person point to the precise area or areas of pain, using just one finger if possible. Notice which part of the neck the person points to, and notice the pattern of any referred pain. This may help you to understand which structures are injured. Sometimes clients come in thinking that they have an upper back, shoulder, or arm injury when in reality they have a neck injury referring pain to those areas. The more trouble the person has in pointing to the location of the pain, the more likely it is that the pain is being referred.

**Is the pain there all the time?**

"All the time" means all day and night and in all positions. If the pain is there all the time, the injury is quite severe and it's possible that a disc is impinging on a nerve or that a joint is inflamed. Pain that comes and goes is generally less serious and less depleting.

**Are the pains sharp and intense or dull and achy?**

If the pain is sharp, the injured tissue is severely inflamed, and therefore you must go very slowly and gently when performing the testing procedures, the palpation, and the hands-on treatment. Sharp pain in the neck generally indicates either a disc injury or a severe ligament injury.

If the pain in the neck is nagging, dull, or achy, this is usually a sign of a less severe ligament injury or adhesive scar tissue in the occipital muscles at the base of the skull. Multiple mild injuries to the ligaments of the neck will cause dull and achy pain that comes and goes.

### **What brings your pain on?**

This question lets you know what positions or activities exacerbate the injury, and in some cases, what the cause may have been. If the pain increases during sleep or just lying down, check to see what position the person sleeps in. A person may also experience pain while sitting in a chair or in the car. In some cases of neck pain, a client will report that a particular treatment modality actually makes the pain worse. During the treatment process, you always want the client to be as comfortable as possible.

### **What makes your pain better?**

Common answers include rest, lying down, standing, exercise, medication, massage therapy, and other treatment modalities. If the answer is rest or lying down, this tells you that whatever is inflamed can be temporarily relieved in a fairly short period of time. If the answer is standing, that means it feels better to have the neck in natural slight extension or what could be called the neutral position. This indicates that the person would do better sitting at the edge of a firm chair with good posture than sitting on a couch or in an easy chair, where the neck is slightly flexed forwards. If the person can exercise without pain, this is good sign that you can build on - in your treatment plan.

It's also important to know whether the client is taking anti-inflammatory or pain-killing medication on a regular basis. During the assessment tests, the client's symptoms may be quite muted by the medication. Take this into account as you assess the severity of the injury.

### **Is your pain getting better, getting worse, or staying the same?**

The answer to this question will help you determine the severity of the injury and the pattern of healing. If the pain is getting better, you want to be sure that the person continues to do whatever it is that has been facilitating the healing process. In such cases, your treatment should accelerate what is occurring already. If the pain is increasing, it is important to discover what is making it worse and change that if possible. If the pain has remained the same for a period of time, this indicates that further intervention is needed to jumpstart the healing process.

### **Does a cough make it worse?**

If a cough makes the pain worse, this indicates a fairly severe problem in either a ligament or a disc. Coughing or sneezing creates a lot of pressure and stress throughout the neck. Look carefully at the disc indicators and check for a very sensitive, inflamed ligament. It is also possible that the client has both of these simultaneously.

### **Does a deep breath make it worse?**

If breathing deeply creates pressure and therefore pain in the neck, this indicates that the injury is extremely severe. You need to tread carefully and gently as you proceed.

### **Does it spread up to your head or down your arm or upper back?**

This question gives you information in three areas: the severity of the injury, the referred pain pattern, and the possibility of multiple injuries. The more severe the injury is, the farther the referred pain will extend. If the injury is mild, the pain might be limited to the neck or referred just to the top of the shoulder. If it is more severe, the pain may extend down to the base of the medial scapula or down the arm below the elbow, and possibly into the hand. The pattern of the referred pain gives you an indication as to which structure is injured.

### **Have you had any treatment for your pain?**

**If so, what?**

**Did it help you?**

You want to know about any treatments that have failed and any that have worked. Ask if it was a positive or negative experience. If it was a negative experience, ask about what the experience was like. This will help you to avoid repeating an error that was made previously.

### **Do you have any numbness or numb-like sensations?**

**If so, where?**

The answers to these questions will indicate the seriousness of the injury and the type of structures that may be involved. Actual numbness is generally caused by disc compression, while numb-like sensations are generally caused by injuries to ligaments and other soft tissue.

### **Do you experience any pins and needles, tingling, or other unusual sensations?**

**If so, where?**

These sensations can give you information about the structures that may be injured or other complicating conditions. It's also helpful to get an understanding of how this client experiences pain or discomfort. Understanding the descriptive language of your clients helps you to communicate more effectively with each person.

### **Do you have any aches and pains anywhere else in your body?**

This is an important question to ask to get the overall picture of the person's musculo-skeletal health. Remember that you asked this question in another form at the beginning of the history. The person is likely to give you more information now, after having some time to become comfortable with you and to focus on the details of their pain. Many people have more than one injury in their body. They may have already explored several different modalities and given up trying, or they may think there's nothing anyone can do to get rid of their pain. The person may also tell you that they have pain in many parts of their body, but didn't think it was relevant.

**Do you smoke?**

Regular smoking significantly diminishes a person's healing capacity.

**Are you allergic to anything?**

Allergies are sometimes an indication of a nutritional deficit. If the client is allergic to many things, it may be wise to use a non-allergenic oil during the treatment.

**Are there any other medical conditions I should be aware of?**

This is a broad question that does not pry but gives the person an opening to provide you with additional information that could prove relevant.

**Are you taking any medications?**

If the client is taking medications that diminish pain sensations, you will have to take that into account during both the assessment and the treatment. This question may also give you information about other physical or emotional conditions that the client neglected to tell you about.

**Is there anything else that might be important for me to know that I didn't ask you about?**

At times there is useful information that isn't covered by the preceding list of questions.

# **DVD #3 – Integration: Cervical Concepts and Theory**

## **Referred Pain in the Neck**

Neck injuries frequently cause what we call “referred pain” — pain that is felt at some distance from the site of the injury. As you do the neck tests, the client feels pain in the arm, hand, upper back, or shoulder, as well as in the neck.

The principles of orthopedic medicine teach us that referred pain generally follows four laws:

### **1. Pain Refers Distally**

Referred pain from soft tissue injuries is usually felt distally (i.e., out toward the periphery of the body). In the case of cervical injuries, pain can be referred to the face, head, shoulders, chest, upper back, and scapula region, as well as into the arm and hand.

### **2. Referred Pain Does Not Cross the Midline**

An injury on the right side of the neck will refer pain into the right arm and hand, but not into the left arm or hand. If the injury is precisely in the midline of the supraspinous ligament, pain can be referred to both sides because fibers on both sides of the spine are injured.

### **3. Pain is Referred Within a Dermatome**

During embryonic development, the human body is made up of 32 segments, or dermatomes. The brain remembers these segments and refers pain within their boundaries. The fifth, sixth, and seventh cervical dermatome segments all extend into the arm. Therefore, many neck injuries refer pain into the arm.

### **4. The Severity of an Injury in the Low Back is Directly Proportional to the Distance the Pain Refers**

Therefore, a severe cervical injury might refer pain to the hand, while a less severe injury might refer pain only to the upper arm.

## **The Pathophysiology of Scar Tissue**

Whenever we sustain an injury, our body must compensate for the damage. The ideal would be regeneration: the creation of new tissues that are identical to the old ones. However, in the human body, only a few types of tissue can truly replace themselves after an injury, and this only if the damage is not too severe.

For most cervical injuries, instead of regenerating, the body undertakes a complex healing process that results in scar tissue. Scar tissue is a necessary and useful end product of the healing process. Without it, even minor damage to any body part would permanently debilitate our body. Scar tissue makes it possible for injured structures to maintain their integrity and continue to perform their functions.

Nevertheless, scar tissue is never an exact replica of the damaged tissue it is trying to replace. Even when it develops normally, it is generally denser and weaker than the tissue it replaces. Problems during the healing process can lead to the growth of abnormal adhesive scar tissue. Internal adhesions occur when scar tissue fibers develop inside an injured structure and link too densely with one another in random, unaligned patterns. This occurs frequently in the cervical region and is the cause of the chronic nature of neck pain. External adhesions may form as layers of scar tissue grow outward from the injured area and attach themselves to nearby, healthy structures.

The three phases of the body's response to an injury clarify how scar tissue forms, what role it plays in the healing process, and why that process sometimes goes awry.

### **The Acute Phase**

Beginning at the moment of injury and lasting for approximately four days, the body undertakes a phenomenal number of activities geared toward restoring the integrity of its tissues. In this acute phase, blood and lymph from torn vessels coagulate to seal off the injured area and help prevent the spread of infection. Intact vessels at and near the site of the injury dilate so that the body can deliver extra fluids and chemicals. This influx results in a gel-like substance collecting within and around the injured tissues. The gel contains binding factors that help to hold the injured tissues together.

In most cases, we experience inflammation — redness, heat, and swelling — as a result of these processes. Although inflammation is a normal part of healing, problems can arise if the internal swelling is excessive or lasts longer than necessary. In such cases, the gel becomes clogged with its binding factors, leading to the formation of abnormally dense scar tissue and/or adhesions between structures in the next healing phase, the rebuilding phase.

Another critical process that occurs in the acute phase is infection control. First, a specialized type of white blood cells attacks and digests the bacteria, reducing the chance of infection. Soon

this job is taken over by other white blood cells, called macrophages, which digest not only bacteria, but also any dead tissue left behind from the injury. Macrophages are also responsible for letting the body know how many repair cells, known as fibroblasts, will be needed during the next phases of healing. If infection and prolonged inflammation cause the macrophages to be overly active, an excessive number of fibroblasts will be called to the injury site. This, again, will lead to the formation of abnormal adhesive scar tissue.

The last major component of the acute phase is the laying down of new, fragile capillaries to replace the injured blood vessels. These begin to restore blood flow to the injured tissues in the affected area.

To support the healing process in the acute phase, it's important to monitor three vital processes that occur during this time: inflammation, infection control, and blood vessel re-growth. Apply ice, compression, elevate and rest, or the RICE protocol, to prevent inflammation and swelling from becoming excessive or lasting too long. Therapeutic massage may assist the movement of fluid surrounding the injured tissues so that swelling is kept to a minimum. The person should see a physician if there are any signs of infection — such as fever, increased inflammation, or pus. Gentle movement is important but excessive movement of the injured area should be avoided during the acute phase to help keep the new capillaries intact.

### **The Rebuilding Phase**

The period from about four days to three or four weeks after an injury is known as the rebuilding phase. During this phase, the most important process is the production of collagen by the fibroblasts. In general, the collagen protein forms fibrils that connect with one another into fibers of various patterns, creating connective tissues throughout the body.

During the rebuilding phase, fibroblasts produce Type III collagen; Type I collagen, the primary component of scar tissue, forms later. Type I collagen is stronger than Type III, but neither of these collagens has the full strength of the tissues they replace.

The fibroblasts also pour lubricating substances into the fluid around the injured tissues. This lubricant helps the collagen fibers travel throughout the area to reach and rebuild the tissues. Within this fluid, the collagen fibers meet, line up, and form bonds with one another. For scar tissue to form normally, the proportions of collagen fibers and lubricating fluid must be just right. In a perfect scenario, this results in good, strong scar tissue without adhesions.

However, if extreme inflammation and swelling summoned too many fibroblasts and caused excessive binding factors in the injured tissues during the acute phase, these precursors will lead to the formation of internally adhesive scar tissue, and sometimes to external adhesions as well, in the rebuilding phase.

Having too little lubricating fluid is also a problem. Without enough fluid around them, the collagen fibers are unable to move easily through the injured area. Instead of lining up in

parallel and binding normally, the fibers pile up haphazardly and form excessively dense connections with one another. The result is thickened scar tissue with internal adhesions.

During the rebuilding phase, it is vitally important to allow gentle movement of the injured region. Immobilizing the area at this time causes the lubricating fluid to be lost which prevents the collagen fibers from being able to disperse. This significantly contributes to the growth of abnormal scar tissue. Regularly performed mobilization of the area through a full and gentle range of motion — whether actively through exercise or passively with the help of a trained therapist — helps to maintain the fluid level. Additionally, the application of massage and friction therapy helps the collagen fibers to move, align, and join in a normal fashion.

### **The Remodeling Phase**

Starting in the late rebuilding phase and continuing for six months or even a year after the injury, the body works to remodel the rebuilt tissues into as close an approximation of the original tissues as possible. Under normal conditions during this phase, the rate at which new collagen fibers are formed at the injury site slows down and becomes equal to the rate at which old collagen fibers are broken up and removed. The amount of scar tissue achieves a steady state and the scarring process stops. However, since new collagen is constantly replacing old, there are continuing opportunities for the scar to adapt to its surroundings.

Various factors affect how the remodeling collagen fibers line up with one another, and whether the resulting scar tissue develops densely, loosely, outside its original boundaries, or with adhesions. For our purposes, the most important factor is the amount of tensile-force or pulling-tension that is applied to the tissue during scar remodeling. This force can be applied either through mild stretching or contracting movements.

Scar tissue is less flexible than the tissue it replaces. However, properly formed scar tissue does not interfere with normal movement. In the presence of a full range of motion, with the application of appropriate tensile forces, the collagen fibers arrange themselves in an elongated formation, rather than a dense conglomeration. These long fibers are not capable of movement by themselves, but they can fold in on themselves when the surrounding healthy tissue shortens and lengthens as it extends. In this way, the elongated scar tissue mimics the movement of normal tissue. Evidence suggests that movement and tensile forces also result in a stronger scar.

To achieve optimal results, movement and tensile forces must be applied in the correct alignment. When movement and exercise are not done in proper alignment, haphazardly growing scar tissue adheres to adjoining tissues. Later, when normal movement is attempted, the adhesions repeatedly tear, re-form, and then tear again, causing chronic, recurring pain.

There are also other interventions that can facilitate the formation of healthy scar tissue. Some medical procedures are available from skilled physicians to help proliferate—that is, regenerate and replicate—tissues that suffer from laxity and chronic re-injury. A common and usually effective technique is cross-fiber friction. When applied by a skilled orthopedic massage

therapist, friction therapy helps break apart old adhesive scar tissue and helps the new tissue develop in the correct alignment.

## **Predisposing Factors**

Predisposing factors, such as poor nutrition and lack of exercise, can make a person more vulnerable to injury. Keep them in mind not only when taking the history, but also while you're treating the client.

### **Poor Alignment and Postural Habits**

Poor alignment and postural habits can have a profound effect on the health of the neck. These make the neck much more vulnerable to injury and complicates the recovery process. If your client has poor habits of posture or movement, it's important to address these to facilitate the healing process and prevent further injuries. Alexander Technique teachers or Feldenkrais practitioners may be helpful in this regard.

### **Stress**

Continual stress adversely affects our immune system, our nervous system, and the soft tissues throughout our body. When we're stressed, our muscles can become continually constricted — therefore diminishing our blood circulation, flexibility, and endurance. People in distress also have accidents more frequently.

### **Chronic Muscle Tension**

If an individual is chronically under stress, this often translates into chronic muscle contractions in the neck area. This tension is particularly acute at the occipital and suboccipital region, in the sternocleidomastoid muscles that rotate the head, and in the muscles of the anterior neck and jaw. Following an injury, chronic muscle tension in the neck restricts circulation and increases the healing time.

Muscle tension can also make certain injuries more likely to occur. In particular, there is an important link between muscle tension and ligament sprains. It is normal for the spaces between the intervertebral discs to narrow somewhat with age, as the discs harden over time. Often, however, excess tension in the erector spinae muscles causes these spaces to narrow prematurely. If these muscles are chronically tense, they constantly exert a compression force even greater than that of gravity, and therefore squeeze the vertebrae more forcefully together. Such unnatural compression leaves the supporting ligaments that surround the discs in a routinely slackened state. If a ligament goes slack for any significant period of time, it begins to weaken and atrophy. When a weakened ligament is repeatedly called upon to perform quick, sudden actions, it will stretch or tear slightly.

### **Sleep**

Sleep is intended to be a time of healing, restoration, and recovery. High levels of stress can prevent the occurrence of the deepest phase of sleep, known as Stage 4, or Delta sleep. In

addition to the quality of a person's sleep, sleeping positions can also have a profound effect on the health of the neck. A person's sleeping position can cause excess rotation, excess flexion, or excess side flexion of the neck for extended periods of time.

### **Poor Nutrition**

Another factor that can make a person vulnerable to injury and slow the healing process is inadequate nutrition. It's important for our clients to understand the importance of drinking an adequate amount of water and eating balanced meals throughout the day.

### **Lack of Exercise**

When people don't exercise regularly, their vulnerability to injury is greatly increased. Exercise helps to maintain our cardiovascular health, build our strength and flexibility, and preserve the health of our joints.

### **Spondylolisthesis**

Spondylolisthesis is a congenital condition in which one or more of the vertebrae are substantially misaligned. A vertebra may be one-quarter to one-half inch out of alignment, anteriorly or posteriorly, instead of sitting squarely on the vertebra below. Individuals with spondylolisthesis are more vulnerable to injuries to the spinal ligaments and discs.

### **Osteoarthritis**

Osteoarthritis is abnormal bone growth that blocks the normal functioning of a joint. As we age, almost everyone develops some osteoarthritis in the neck. Small to medium sized bone spurs appear, and the bones remodel themselves in reaction to various compression forces and ligament laxity. Osteoarthritis can decrease the range of motion in the neck, making it more likely that the neck ligaments will be injured.

## **General Concepts: Disc & Ligament Injuries**

### **Lesion**

Lesion is a general medical term for an injury or dysfunction in any tissue.

### **Nerve Root Lesion**

A nerve root lesion, or radiculopathy, is what the general population refers to as a pinched nerve. This condition is usually caused by compression of the root of the nerve by a damaged, protruding disc.

### **Paresis**

Paresis is the technical term for motor weakness. There are two distinct categories of weakness: specific and generalized.

### **Specific Weakness**

In specific weakness, an impingement of a particular nerve causes atrophy and subsequent weakness in all the muscles controlled by that nerve. Specific weakness does not develop until some time after the appearance of pain & limitation. It usually takes at least three months of atrophy for arm or hand weakness to become noticeable.

### **Generalized Weakness**

In contrast to specific weakness, which affects a limited subset of muscles, generalized weakness affects many different muscle groups. During an assessment, this will manifest as weakness on a variety of resisted tests. Here the cause is disuse, rather than nerve root compression. Generalized weakness is relatively common in clients with cervical injuries. As everyday physical activities begin to cause pain, people tend to significantly limit their movements which causes many different muscles to atrophy.

### **Neuropathy**

Neuropathy means abnormal functioning of a nerve or nerves. One type of neuropathy is neuritis, in which a nerve becomes inflamed for no apparent reason. Neuritis results in weakness that lasts from three weeks to six months, and then resolves by itself.

### **Ligament Laxity**

When a ligament is lax, it is longer than it should be. Sometimes it is congenital - a person may be born with ligaments that are too long. Alternatively, a severe injury can stretch the ligament,

or a series of chronic ligament injuries may cause the formation of scar tissue that stretches over time.

### **Segmental Weakness**

Segmental weakness is laxity in the ligaments that attach two of the vertebrae at a particular level - for example at C4 to C5. This makes that particular spinal joint unstable, and makes it more likely that a sudden movement will “yank” the ligament and cause damage.

### **Post-traumatic Adhesions**

Post-traumatic adhesions are bands of fibrous scar tissue that develop in an injured area. They commonly occur after a whiplash accident at the tenoperiosteal junctions of the occipital muscles, at the base of the skull. People often experience this injury as an occipital headache.

### **Paresthesia**

Paresthesia is the medical term for a feeling of pins and needles, or tingling. This often occurs when there is pressure on a nerve trunk or an artery.

### **Dysthesia**

The term dysthesia refers to an odd, distorted sense of touch, and is generally associated with connective tissue strain.

Examples include:

- thermal distortions in which a person experiences pain when touching warm or cool surfaces
- creepy-crawly feelings across the midback and neck
- a pulling sensation in the front of the neck or throat
- a constant sense of buzzing in a part of the body
- a feeling of swelling that is not physically there
- a cold, uncomfortable sensation in the teeth

### **Cutaneous Analgesia**

Cutaneous analgesia is the medical term for a “numblike” sensation. This is much more common than complete numbness. Often clients will report that an arm is numb, when in reality it is numb-like. When you touch the arm, they’ll be able to feel it. If the arm were actually numb, the person would feel nothing at all.

## **Cutaneous Anesthesia**

Cutaneous anesthesia is complete numbness, or lack of sensation. This does not usually occur in the neck, but it does sometimes happen in the arm or hand. When a client reports numbness, confirm it by trying to touch the area with a brush or a finger to see whether there's really no sensation or just diminished or altered sensation.

## **Cervical Spondylosis**

Cervical spondylosis is a general term referring to chronic degeneration of the vertebrae and discs in the neck. This condition is most likely caused by wear and tear on the structures in the neck over time. It usually appears in individuals over 40, and progresses with age. There are a variety of changes to the vertebrae and discs that may accompany cervical spondylosis, including: the formation of osteophytes, or bone spurs, which may cause no symptoms, or may put pressure on the spinal nerves; joint narrowing from disc erosion; osteoarthritis, causing neck pain and headaches; and cervical disc lesions, causing neck pain, arm pain, headache, weakness, scapular pain, and other symptoms.

## **Cancer**

If a client has cancer, the assessment tests might yield some unusual results. You might find bilateral weakness, so that when you test for strength, both the right and left sides are weak, or there might be many roots that show weakness. This would be a rare finding for a nerve root injury.

In a medical setting, you might hear technical terminology related to cancer. Neoplastic erosion is a hole in a bone caused by cancer. When cancer spreads from one site to another, the growths at the new location are called secondary deposits.

## **Zygapophyseal Syndrome (Facet Syndrome)**

The proper name for the joints commonly called facet joints is zygapophyseal joints. These are small synovial joints, and - like other synovial joints - they can become inflamed.

## **Whiplash**

This term describes a forward and backward motion of the head. It is not a clinical finding identifying any specific damage. Whiplash commonly occurs in motor vehicle accidents, but can occur in other circumstances as well. A number of different injuries can result from a whiplash incident: discs can rupture, muscles and ligaments can strain or tear, and bones can fracture. Ligament lesions are the most common result of whiplash incidents.

## **Neck Theory and Integration – Injury Profiles**

To effectively assess injuries in the cervical region, it's essential to be able to discriminate between a ligament lesion and nerve root compression caused by injury to a disc. Nerve root compression is the cause of fewer than 5% of cervical injuries. The overwhelming majority of neck injuries involve the ligaments.

### **Differentiating a Ligament Injury from a Disc Injury/Nerve Root Compression**

| <b>Ligament Injury</b>                                | <b>Disc Injury/Nerve Root Compression</b>                                                  |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Slow, achy, diffuse pain                              | Fast-moving, hot, sharp, electric pain                                                     |
| Proximal pain                                         | Distal pain                                                                                |
| Pain referred within dermatome (some exceptions)      | Pain referred within dermatome                                                             |
| Pain that switches sides<br>Pain on right and/or left | Pain on one side only                                                                      |
| Pain that comes and goes                              | Constant pain                                                                              |
| Numb-like sensations                                  | Confirmed numbness                                                                         |
| No loss of sensation                                  | Diminished or loss of sensation                                                            |
| Tingling sensations                                   | Pins and needles sensations                                                                |
| No specific weakness                                  | Weakness in one segment                                                                    |
| Normal reflexes                                       | Diminished or absent reflexes                                                              |
| Limitation of movement caused by pain                 | Asymmetrical limitation of movement caused by involuntary muscle spasm in reaction to pain |
| Soft or spongy end feel                               | Hard end feel                                                                              |
| Local and referred pain on palpation of ligaments.    | No pain on palpation unless ligaments are also injured.                                    |

Both ligament and disc injuries cause pain, but the quality of the pain is different. Nerve root lesions tend to cause 'hot,' 'sharp,' 'electric,' fast-moving pain. Ligament lesions tend to evoke a slower, aching, more diffuse kind of pain.

A second difference between disc and ligament lesions relates to the part of the relevant dermatome to which the pain is referred. Disc lesions often create referred pain felt only in the distal part of the dermatome - with no pain in the proximal part. Ligament lesions, on the other hand, tend to create referred pain felt in the proximal part of the dermatome but not in the distal part. This is not definitive, but it's a useful aid in making the disc-versus-ligament distinction.

Pain is almost always referred within a single dermatome. However, orthopedic physicians have noted occasional exceptions in cases of ligament injury. Another factor differentiating ligament lesions from disc lesions is the lateral distribution of pain. If the pain switches sides or occurs on both sides, it is likely to be caused by a ligament strain. With a disc lesion, the pain is almost always on one side only. In addition, pain caused by nerve compression tends to be fairly constant. With a ligament injury, the pain usually comes and goes.

If a ligament is injured, there may be some numb-like sensation, but not complete numbness. The person can tell when they are being touched. With a disc lesion, actual numbness may occur in a circumscribed area of the skin. An injured disc may also produce a feeling of pins and needles that is reasonably constant or frequent. An injured ligament may produce odd tingling sensations that come and go.

Symptoms of weakness and changes in reflexes are some of the most important factors distinguishing ligament lesions from disc lesions. If there is a disc compression, weakness will occur at only one level of the spine. These muscles will be noticeably atrophied as well. In cases of ligament injury, you won't see this type of specific weakness. If the person's muscles are weak, it will be a generalized weakness due to disuse. With a ligament injury, you also won't see any reflex changes in the arm. If a disc is injured, there may be diminished or absent reflexes in the arm.

Another telling feature of an injury is the type of limitation of motion it causes. When a disc lesion is present, an asymmetrical pattern of limitation results. In each case, moving in one direction - and not the other - causes pressure on a disc, and therefore on a nerve. When the head starts moving in that direction, an involuntary muscle spasm occurs to prevent this from happening. The resulting end feel is rock hard. In contrast, the limitation caused by a ligament sprain is not asymmetrical, and is caused by avoidance of pain rather than by a muscle spasm. The full range of motion will generally still be available, although it may be very uncomfortable to accomplish. The feeling at the end of the movement will be soft and spongy, not hard.

Always keep in mind that it's quite possible - and in fact likely - that a person who has a disc lesion will have ligament lesions also. The ligaments are part of the structure that holds the discs in place. At times the ligament injuries may be producing more of the pain than the disc injury.

## **Injury Profiles**

### **Ligament Injuries**

The most important thing to note about ligament injuries in the neck is that they are extremely common. Ligament injuries often lead to chronic pain due to poorly formed adhesive scar tissue. This has much less integrity and uniformity of structure than the original tissue it replaces, and is therefore vulnerable to being re-torn again and again, causing increasing pain. Hands-on friction therapy can help eliminate adhesive scar tissue and prevent it from re-forming.

Two commonly injured neck ligaments are at C5 and C7. The ligament injured most often is the C5 supraspinous ligament, which attaches the spinous processes of the C5 and C6 vertebrae. The other commonly injured neck ligament is the C7 intertransverse ligament (or TP7 ligament), which attaches the transverse processes of the C6 and C7 vertebrae. Remember that some clients have both disc lesions and ligament lesions.

This chart shows referred pain patterns for the supraspinous ligaments.

|    |                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------|
| C1 | Top of head                                                                                                        |
| C2 | Forehead<br>Temples<br>Behind eyes                                                                                 |
| C3 | Temples<br>Side of neck and throat                                                                                 |
| C4 | Neck<br>Top of shoulder<br>Upper chest<br>Upper scapular area                                                      |
| C5 | Neck<br>Upper scapular area<br>Lateral aspect of arm to root of thumb                                              |
| C6 | Neck<br>Upper scapular area<br>Lateral, anterior aspects of arm<br>Radial aspect of hand to thumb and index finger |

|    |                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------|
| C7 | Neck<br>Scapular area<br>Pectoral area<br>Posterior arm to middle three fingers                               |
| C8 | Lower scapula<br>Posterior and inner upper arm<br>Inner forearm<br>Ulnar aspect of hand<br>Last three fingers |

This second chart outlines the unique referred pain patterns caused by the cervical intertransverse ligaments.

|            |                                                                                          |
|------------|------------------------------------------------------------------------------------------|
| C2–3, C3–4 | Side of neck<br>Upper deltoid<br>Top of shoulder<br>Temporal area<br>Sternocleidomastoid |
| C4–5       | Upper arm<br>Lower arm to root of thumb                                                  |
| C5–6       | Upper arm<br>Lower arm to thumb and index finger                                         |
| C6–7       | Chest<br>Lateral upper arm<br>Medial border of scapula                                   |
| C7–T1      | Medial border of scapula<br>Posterior scapula                                            |

Finally, here are the referred pain patterns that may be caused by the nuchal ligament or thoracic ligaments.

|                    |                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Nuchal ligament    | Upper back (bilateral) in the shape of a coat hanger                                                                                              |
| Thoracic ligaments | T1 and T2 injuries may cause pain in the arm and scapular area<br>T3–T8 may also cause scapular area pain<br>Pain down the arm with neck rotation |

### **Assessment Profiles of Specific Ligament Injuries**

When analyzing the results of orthopedic tests, we make a distinction between Major Indicators, Auxiliary Indicators, and Minor Indicators. Major indicators, also called major signs, provide the most important data about an injury. Auxiliary indicators are helpful in steering you toward the correct conclusion, but are not as definitive as major indicators. Minor indicators, or minor signs, are test results that are potentially confusing.

#### **Upper Cervical Ligament Injuries - C1 through C3**

- ❖ Major Indicators:
  - One or both passive rotations of the neck are painful and may be limited by pain
  - Passive flexion and/or passive extension are painful and may be limited by pain
  - Pain is felt in the upper neck and head
- ❖ Minor Indicator:
  - One or both side flexions are painful

Injuries to the supraspinous and intertransverse ligaments at C1, C2, and C3 all cause pain in the upper portion of the neck and refer pain into the head only. These injuries are also associated with headache pain. People typically think of headaches as being related to stress and tension or a genetic predisposition, so a headache caused by cervical ligament injuries may not be properly treated. Even in cases where excessive stress and genetic factors are contributing to a headache, ligament lesions may be making it worse. When you apply cross-fiber friction to a sprained ligament, this may cause referred pain in the areas where the person typically experiences headaches.

## **Ligament Injuries - C4 to C6**

- ❖ Major Indicators:
  - One or both passive rotations of the neck are painful and may be limited by pain
  - Passive flexion and/or Passive extension are painful and may be limited by pain
  - Pain is felt in the middle and lower neck
- ❖ Minor Indicator:
  - One or both side flexions are painful

For the ligaments from C4 to C6, the test results are similar to those we discussed for C1 to C3. The only difference is the location where the pain is felt. Injuries to the supraspinous and intertransverse ligaments at C4, C5, and C6 all cause pain in the middle and lower portion of the neck. They also refer pain into the lower face, anterior neck, upper back, shoulders, arms, hands, and fingers.

## **Injury to the Intertransverse Ligament, or TP7 – C7**

- ❖ Major Indicators:
  - One or both passive rotations of the neck are painful and may be limited by pain
  - Passive extension is painful and may be limited by pain
- ❖ Auxilliary Indicator:
  - One or both side flexions are painful.

When this injury is present pain is felt on one side of the lower neck, frequently radiating down to the medial border of the scapula. The pain from this injury may last for several hours, a week, several months or years. The client may experience a line of pain down the medial border of the scapula, a pain the size of a quarter toward the inferior medial border of the scapula, or a burning pain in the scapula region. Many clients and therapists incorrectly believe these symptoms are caused by a strained rhomboid muscle. If they were caused by a muscle, a resisted test of the rhomboid would reproduce the pain, and a passive neck test would not. This injury is also often misunderstood as a pinched nerve in the neck. This does occur but infrequently.

## **Nerve Root Compression**

Nerve root compression causes fewer than 5% of cervical injuries. These display in three different categories of symptoms: weakness, reflex changes, and diminished sensation. Keep in mind the time frames in which these symptoms tend to appear. Changes in reflexes may occur suddenly or develop slowly over time, depending on the circumstances. Sudden changes may be

due to an accident or other severe trauma, while slow progression may be due to a disc protrusion that develops over a long period of time. Weakness develops as the result of muscle atrophy, which occurs gradually over time. It usually takes at least three months of atrophy for arm or hand weakness to become noticeable. The loss of sensation appears in two basic stages: The sensation of light touch (tested with a brush) diminishes first. The pain and sensation of deep touch (tested with a pin) diminishes second. Likewise, on recovery, the sensation of deep touch and pain returns before the sensation of light touch.

**Table of Root Lesion Symptoms**

| <b><i>Root</i></b> | <b><i>Weakness</i></b>                                                                                       | <b><i>Reflex Changes</i></b> | <b><i>Diminished Sensation</i></b>          |
|--------------------|--------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------------------|
| C1                 | Neck rotation (very rare)                                                                                    | N/A                          | N/A                                         |
| C2                 | Neck rotation (very rare)                                                                                    | N/A                          | Mid-neck                                    |
| C3                 | Shoulder shrug/traps (very rare)                                                                             | N/A                          | Cheek                                       |
| C4                 | Shoulder shrug                                                                                               | N/A                          | Point of shoulder                           |
| C5                 | Biceps<br>Subscapularis<br>Supraspinatus<br>Infraspinatus<br>Deltoid<br>Brachioradialis                      | Biceps                       | Upper arm                                   |
| C6                 | Biceps<br>Extensor Carpi Radialis                                                                            | Brachioradialis<br>Biceps    | Forearm<br>Thumb<br>Second and third digits |
| C7                 | Triceps,<br>Flexor Carpi Radialis                                                                            | Triceps                      | Middle three digits                         |
| C8                 | Flexor Digitorum<br>Extensor Pollicis<br>Adductor Pollicis<br>Flexor Carpi Ulnaris<br>Extensor Carpi Ulnaris | N/A                          | Third, fourth, and fifth digits             |
| T1                 | 4-5th Interosseus                                                                                            | N/A                          | N/A                                         |

There is no disc between the occiput and C1, and no disc between C1 and C2, so if there is an issue at C1 or C2, it is not due to a disc. However, problems with resisted movement of the neck may provide evidence of a serious disease process. Therefore, anyone with extremely weak neck rotation should see a physician immediately. Information about disc lesions comes primarily from testing the areas innervated from C5 through T1 — the shoulder, elbow, wrist, and hand.

### **Other Injuries and Conditions**

#### **Osteophytic Root Pain**

- ❖ Major Indicators:
  - Increasing weakness, usually at one level of the spine
  - Usually over 50
- ❖ Treatment:
  - Drilling out the osteophyte

In cases of osteophytic root pain, a piece of bone grows into the intervertebral foramen and slowly exerts pressure on a nerve root. Occasionally this condition causes considerable neck pain, but usually there is no pain or the pain is very slight — and it rarely refers pain into the arm. The main complaint is increasing weakness at one level, for example at C7 or C5.

#### **Bone Cancer at C1, C2, C3 (Malignancy, Secondary Deposits)**

- ❖ Major Indicators:
  - Rapidly increasing stiffness and pain coming on over a few months
  - Gross limitation of active movements in most directions
  - Spasms of the neck muscles when attempting passive testing
  - Pain and weakness on resisted neck tests

When there is bone cancer in the cervical spine, pain and stiffness increase rapidly over just a few months. There is gross limitation of active movements of the neck in multiple directions. When cancer attacks the upper three cervical vertebrae, the signs are not as clear as when they attack the lower vertebrae, because C1, C2, and C3 do not innervate muscles that can easily be tested.

## **Bone Cancer at C4, C5, C6, C7 (Malignancy, Secondary Deposits)**

- ❖ Major Indicators:
  - Rapid onset
  - Active, passive, and resisted tests limited and painful
  - Two or three nerve roots affected at once
  - Gross bilateral (arm) weakness

When cancer attacks the lower four cervical vertebrae, the signs are clear because you can easily test the C4, C5, C6, and C7 nerve roots with specific resisted movements. The onset of the weakness is very rapid, and it occurs simultaneously on multiple levels. This weakness is also bilateral, affecting both sides of the body. Note that these symptoms differ markedly from those caused by a bulging disc. Nerve compression due to a disc lesion affects only one side of the body, at only one level.

## **Cervical Rib**

The term “cervical rib” refers to an abnormally long transverse process at C7. Having a cervical rib does not necessarily produce any symptoms. When there is trouble, the characteristic signs of this condition include numbness and pins and needles in the arm and hand. An X-ray will definitively establish the presence of a cervical rib.

## **Basilar Syndrome**

- ❖ Major Indicators:
  - Vertigo (dizziness) when the neck is in extension
  - Dizziness when bending or standing suddenly
  - Pins and needles in the face (on occasion)
  - Dizziness and arm weakness on Special Test
- ❖ Treatment:
  - Surgery to drill out the osteophyte
  - Manipulative therapy to correct the subluxation

You may recall from the anatomy section that the vertebral and basilar arteries are key blood

vessels that carry blood from the heart to the brain. The two vertebral arteries — one on each side of the body — run through the transverse foramen of the neck, and then join together inside the skull to form the basilar artery. The basilar artery then makes a right-angle turn before running up to the brain. In a normal person, when the head is rotated, two-thirds of the blood on one side of the neck is cut off. A cervical injury may cause further occlusion, so that even less blood reaches the brain. The most common culprits are osteophytes growing in such a way that they compress the vertebral arteries. This condition may also be caused by a bone subluxation. Basilar syndrome is more likely to develop in elderly people than in younger individuals.

If you suspect a client is suffering from basilar syndrome, you can perform a special test to confirm the presence of this condition. Ask the client to close his or her eyes and hold both arms out in front of the body, while holding the head in active rotation for one minute. If basilar syndrome is present, the person will get dizzy and start to sway. The arms will become weak and begin to waver or drop.

## **Tinnitus**

Tinnitus is the medical term for a constant “ringing in the ears” or other disruptive sound heard in the absence of an external stimulus. It is theorized that tinnitus is caused both by acute neck injuries, as in an accident, and by more gradual disturbances of neck structures, which can occur slowly over time. It often becomes worse with stress or fatigue. Tinnitus is not helped by massage or friction therapy.

## **Torticollis**

Torticollis is an involuntary twisting of the neck that places the head in an unnatural position. There are four primary types of torticollis. Some are painful and some are not.

### ***Spasmodic Torticollis***

In spasmodic torticollis, the person’s head is fixed in a rotated and slightly tilted position. The client or therapist can use their hand to forcefully bring the head back to a neutral position, but then an overpowering involuntary force slowly turns it back to the same side again. The cause is unknown.

### ***Congenital Torticollis***

In this condition, the person is born with a painless, permanent contracture of one sternocleidomastoid muscle. The head is fixed in side-flexion toward the affected side and in rotation away from the affected side as above.

### ***Acute Torticollis in Children (5–10 years old)***

This is usually caused by a swollen gland beneath the sternocleidomastoid. It should resolve within two weeks.

### ***Acute Torticollis in Adults and Adolescents***

The head is fixed in side-flexion, without the rotational element. The pain and restriction are usually felt when sitting up after a night's sleep. This condition is caused by sleeping with the head flexed to one side throughout the night. One theory is that part of the nucleus pulposus has oozed out during that time. It is more likely, however, that a C6–7 intertransverse ligament strain is causing the pain. The problem usually resolves in 7–14 days; with friction therapy it should resolve in 3 to 5 days.

#### ❖ Major Indicators:

- Pain is on only one side only
- Rotation to one side is painful and limited
- Side flexion to one side is limited and painful

### **Spinal Cord Injuries**

The term “spinal cord injury” refers to damage to the spinal cord that results in a loss of function, including the ability to move and to feel sensation. In most cases, the spinal cord is not actually severed, but the nerve cells within the cord are damaged. Spinal cord injuries occur most frequently in the cervical region. A person can “break their neck” or “break their back” and not sustain a spinal cord injury. In these cases the vertebrae around the spinal cord are damaged, but the spinal cord itself is not affected.

The effects of spinal cord injury depend on the type of injury and the level at which it occurs. With a complete injury, no functioning remains below the level of the injury; there is no sensation and no voluntary movement. Both sides of the body are equally affected. With an incomplete injury, there is some functioning below the level of the injury. A person with an incomplete injury may be able to move one limb more than another, may feel sensation in a body part that cannot be moved, or may have more functioning on one side of the body than the other.

In most cases, spinal cord injuries cause severe pain, weakness, and tingling in the upper arms or in all four limbs. Muscle atrophy proceeds very rapidly. These injuries may also cause a variety of other symptoms.

- ◆ Tetraplegia has replaced the term quadriplegia to refer to a loss of muscle strength and function in all four limbs. It is caused by an injury to the spinal cord in the cervical region.
- ◆ Paraplegia is a loss of functioning in the lower portion of the body, usually affecting both legs. It is caused by injury to the spinal cord in the thoracic or lumbar region.
- ◆ Clonus refers to involuntary movement of the foot or knee after a sustained sharp

pressure is applied. The presence of three or more beats indicates that there is pressure on the spinal cord, which interferes with its natural inhibiting function.

- ♦ The Babinski test involves stroking the underside of the sole of the foot along the outside edge. If this stimulation causes the big toe to go into extension involuntarily, the test is positive, indicating that there is spinal cord pressure.
- ♦ Hyporeflexia is an early symptom of spinal cord pressure. A person with hyporeflexia has reflexes that are very sluggish, weak, or absent.
- ♦ Hyperreflexia occurs shortly after hyporeflexia. In hyperreflexia, reflexes are overresponsive, far in excess of the normal reaction.

## **DVD #4 - Treatment Techniques**

### **Principles of Friction Therapy to the Neck**

Cross-fiber friction therapy is a very precise form of injury treatment that is remarkably effective in treating most muscle, tendon, and ligament injuries. It was developed by Dr. James Cyriax, a British physician who has since become known as the “father of orthopedic medicine.” Frictioning addresses the problem of adhesive scar tissue formation in muscles, tendons, and ligaments, which is the cause of a great deal of chronic pain. In a healthy healing process, scar tissue serves as the biological glue that holds the torn fibers together in proper alignment. However, in many cases, this process goes awry.

Adhesive scar tissue builds up in an indiscriminate fashion, so the resulting tissue has much less integrity and uniformity of structure than the original tissue it replaces. Friction therapy breaks down poorly formed scar tissue and prevents its return. It also promotes the formation of properly aligned and mobile tissue, encouraging normal healing to occur. In addition, by introducing a mild, controlled trauma at the injury site, frictioning increases the blood supply to areas that normally have very little circulation.

#### **Don't Over-treat**

Always err on the side of caution, so you don't over-treat. It's very easy to over-treat someone when you're frictioning the spinal ligaments. Work very lightly during the first treatment to see how the person responds, then use that information to guide your future treatments, where you may be able to use more pressure.

Be sure to tell your client that the area you treated might be a little sore for a day or two, but the discomfort shouldn't last more than 48 hours. At the second appointment, find out how the client felt after the initial treatment. If the post-treatment soreness lasted longer than 48 hours, or if the client simply can't tolerate the soreness, cut back on the pressure and/or the duration of the treatment.

### **Guidelines for Frictioning the Cervical Spine**

- ❖ Use no lubricants
- ❖ Keep your friction strokes perpendicular to the fibers of the injured tissue
- ❖ Apply pressure in one direction only
- ❖ Alternate the direction of pressure as often as needed for your own comfort
- ❖ Work on one side at a time
- ❖ Use varied finger positions
- ❖ Keep your fingernails very short
- ❖ Alternate hands often
- ❖ Move your whole hand
- ❖ Make sure the skin moves with you
- ❖ Press the structure against the bone
- ❖ Be sure the client is comfortable

## **Friction Treatment Protocol**

### **Frequency**

When clients are receiving friction therapy in the cervical region, it's best if they come two or three times per week. Consistent treatment aids the healing process. As recovery proceeds, you can lessen the frequency of your sessions.

### **Duration**

With this treatment, a recent injury takes about 4–6 weeks to heal, and a long-standing injury takes about 8–12 weeks.

The actual healing time will vary depending on several factors:

- 1) How long the injury has been present
- 2) Whether the person is repeatedly re-injuring the neck
- 3) The client's general health

Ideally, you'd begin treatment 48 to 72 hours after a traumatic injury. Thirty seconds to one minute of gentle frictioning at each site should be adequate. However, you generally won't see clients who are that recently injured. In most cases there are multiple neck injuries, so you'll be doing friction for 5 to 10 minutes at first, and eventually increasing to 20 or even 30 minutes in each session.

### **Pacing**

Typically, 5 to 15 neck ligaments are injured simultaneously. After you've frictioned a ligament for a few minutes, move on to the next one. The neck is often too sensitive to tolerate too much work on one segment. As you progress, slowly work more deeply.

It's important to avoid over-treating with friction therapy - particularly when you're working in the cervical region. Some clients can tolerate only very light pressure at first, and you may have to work for a long time using barely any force. Educate your clients so they can help guide your work. Before you begin, explain that the process of breaking up scar tissue is somewhat uncomfortable, but should not cause acute pain.

Check in frequently with the client to be sure you're using the optimal amount of pressure - especially if you suspect the person may be reluctant to tell you to 'lighten up'. If the client feels more than a slight discomfort or a mildly annoying sensation, you need to proceed more gently.

While you're working, also be alert for any nonverbal cues of discomfort. Observe your client's

face and breathing during the frictioning. If the client says everything is fine but constantly grimaces throughout the treatment, decrease your pressure. Also be aware of your own level of comfort. Because this work is so precise and repetitive, you may find yourself getting tired and sore at first. Build up your hands by frictioning for short periods at first, and by exercising with clay or a squeeze ball.

### **Post-friction Guidelines**

After you've completed a session of friction therapy, fully massage the cervical area, both supine and prone. This helps to enhance circulation in the cervical region. At the end of the appointment, remember to mention that the area you treated may be sore for up to 48 hours. If the client tolerates ice well, using ice on the area will often mitigate the soreness. Check in at the next appointment to find out how the client felt after the treatment. If soreness lasted for more than two days, or if the client simply can't tolerate the soreness, cut back on the pressure and duration of the friction part of your treatment.

# **Friction Therapy**

## **Friction Therapy Techniques**

### **Supraspinous Ligament Friction**

Sitting at the head of the table with the client lying supine, place your hands under the neck. Use your middle or index finger to palpate the spinous processes. Feel their shape, depth, and alignment. You can start frictioning at the top of the neck or at the base of the neck. In this example, begin at the base of the neck. Place your right middle or index finger just above C7 on the ligament that runs between C6 and C7. Lightly touch the center of the ligament with your fingertip and move the skin to the left as far as you can. This allows you to friction the ligament without dragging your finger across the skin. Now exert an anterior pressure and pull to the right, allowing your finger to friction transversely through the ligament for a distance of three quarters of an inch to an inch, depending on the mobility of the skin. Then return to the original position on the other side of the vertebra where you began. Use no pressure on the return movement. Depending on the individual you're working on, you may or may not feel a "snapping" sensation as you move across the ligament. The ligament will be elusive at first. It feels like a flat, thin nylon cord. Continue this action for a minute or two. Be sure to check in with your practice client about the pressure. Switch hands and pull across the ligament in the opposite direction. Again, you may or may not feel a 'snap' as you go over the ligament structure. After working for a couple of minutes on this ligament, move to the next one and repeat the same procedure. Work your way up or down one by one, frictioning each ligament. Stop at the tender ligaments for slightly longer periods of time. If all the supraspinous ligaments are injured, you might work for ten or even fifteen minutes on these ligaments alone.

### **Supraspinous Ligament Tilted-head Friction**

In this technique, you will be working on the lateral edges of the supraspinous ligament. To get to that part of the ligament, tilt the client's head to one side. In this example, start by tilting the head to the right. In this position, the ligament on the left lateral edge is more accessible. Slide your right hand under the neck to the left side, and place your fingertip at the very outer edge of the ligament. Friction for a minute or so, stroking toward the right, and then work your way up or down the vertebrae one by one. These are very precise small movements that move through no more than a half to a quarter inch of space. It's like polishing the tiny edge of a spoon. When you're finished with this side of the neck, switch hands to work on the opposite side.

### **Intertransverse Ligament Friction**

Support the head gently with one hand and place the tip of your thumb (fist position) or index finger on the uppermost transverse process. Apply pressure toward the midline and slowly friction in an anterior-to-posterior direction, always taking the skin with you. Use whichever

finger is most comfortable for you, and switch hands and fingers frequently so they don't become strained. Gradually work your way down, frictioning each ligament. Friction both the upper edge of the transverse process (which works the ligament attachment above) and the lower edge (which works the ligament attached to the transverse process below).

One variation of this technique that's more restful for the hand is to reach under the neck and use the middle or index finger to friction the ligaments on the opposite side. This works better for some practitioners. Another variation is to tilt the head away from the side you're working on. This gives you better access to the ligaments. Generally, you'll perform intertransverse ligament friction for several levels, and then repeat the same technique on the opposite side. If the transverse processes are very tender, you might alternate between right and left at each level. If there is not much discomfort, you might work all the way down before switching to the other side. Work on each tender structure for one to two minutes, depending on the client's tolerance. If many ligaments are injured, which is often the case, spend less time on each of the structures and keep coming back to them. This may be easier for the client to tolerate until the pain diminishes. Remember to make your movements very, very small. Watch the client's face and check in frequently about the level of discomfort, so that you don't get carried away.

There are also other structures in this area that occasionally get inflamed - the capsules of the zygapophyseal joints. These are the hard surfaces you'll feel just posterior to the transverse processes. If any of the capsules are tender to the touch, work there for a while as well, using the same types of small movements.

## **TP7 Ligament Friction**

The TP7 ligament is one of the most commonly injured structures in the neck. To begin the friction technique for this ligament, support your thumb with your index finger curled beneath it, and push the trapezius back out of the way. Then press medially and inferiorly until you feel a hard protuberance. When you find the transverse process, place your thumb tip on it. Now work your way to the back of the process and friction in an anterior-to-posterior direction. Move in a diagonal line, while pressing slightly toward the midline. Friction on one side for a few minutes, and then move to the other side. As you friction the TP7 ligament, the client may feel a referred pain in the medial border of the scapula. On rare occasions, pain will be referred to the upper scapula or even the temple. When you feel comfortable finding the TP and frictioning the ligament with some ease, try the lateral aspect of the same ligament. To find the lateral portion of this intertransverse ligament, move laterally about a quarter inch to the lateral edge of the TP and friction there in an anterior to posterior direction. The lateral portion of this TP7 ligament refers pain to the top of the shoulder between the neck and acromio-clavicular joint. When you're comfortable with that, you can move to the anterior edge which refers pain down the chest. Here the friction will be in a medial to lateral direction.

### **TP7 Ligament Friction, Prone**

This variation is easier for some practitioners. Ask the client to lie face-down, and place your middle or index finger on the C7 spinous process. Then move laterally over the edge of the trapezius, and pull the trapezius back out of the way. Now press your finger medially and inferiorly to find the transverse process of the seventh cervical vertebra. Once you find it, move to the posterior portion of the process. Friction in an anterior-to-posterior direction, moving on a slight diagonal toward the lower spine.

### **Occipital Muscles Friction**

Gently cradle the head with one hand, and work with the index and middle fingers of the other hand. Brace your finger with the thumb, making your pressure more effective and easier on your own joints. Now place your fingertip at the occipital region, just lateral to the external occipital protuberance. Exert pressure anteriorly and move your finger first medially, then laterally, applying pressure in one direction only. The medial movement stretches the skin so you can bring it with you when you friction. The second movement is where the pressure is applied. After doing this in one spot for a minute or so, move laterally a quarter to a half-inch and do it again. Continue moving out until you reach the edge of the occipital region and then repeat, applying your pressure in the opposite direction. This time, straighten the skin laterally and apply pressure medially. Then change hands and work on the other side.

The best way to master this material is to have a private tutorial with one of my teachers after learning the hands on techniques. If you live in or near Albuquerque (NM), Boston (MA), Chicago (IL), Olympia (WA), Salt Lake City (UT), Seattle (WA), Washington, DC, or Barcelona, Spain, contact one of my instructors through my office and take a private tutorial.

## **Myofascial Therapy**

The ligaments of the neck are encased in a fascial covering. Sometimes this fascia is injured along with the ligaments and must be addressed in treatment. Begin with the myofascial work, then do friction therapy, and then end with massage therapy. To assess whether scar tissue adhesions in the fascia are contributing to a person's pain, try performing just a few strokes of the fascial separations.

### **Supraspinous Fascial Separation**

First you'll be working on the superficial fascial covering of the nuchal and supraspinous ligaments. It is easiest and best to perform this technique with the person lying supine. Place both of your middle or index fingers at the base of the neck on the supraspinous ligament, just below the C7 spinous process. If you are more comfortable using one finger, place your other hand at the side of the head to stabilize it. Use the pads of your fingers to apply a medium pressure directly to the ligament, pressing on the central portion of the spinous process. Let your fingers sink into the tissue, exerting an anterior and superior pressure. Remain there for 30 to 60 seconds or so, without moving, and then slowly move your hand toward the top of the neck.

Move slowly and deliberately, working in the direction of the fibers. It may take you a minute to several minutes to travel the few inches from the base of the neck to the base of the skull depending on the resistance you meet. If there is discomfort in any segment of the ligament there will be some resistance. Also, have the client tell you if there is any discomfort. If there is resistance or pain of any kind, move even more slowly. Repeat this technique a few times. If the fascia in this area is restricted or injured, your stroke may feel a little painful. If there is extensive injury to the fascia, the movement can be very painful. In such cases, go ahead to the next movement in this protocol, where you'll be working transversely, and use a tiny bit of lubricant if needed to minimize the drag along the skin and fascia.

Working transversely is generally less uncomfortable than working longitudinally. Here you're stroking across the fascia horizontally, both to the right and to the left. Start by reaching under the person's neck with your right hand so you can access the left side of the spinous process. Begin at the base of the neck. Place your middle or index finger firmly on the ligament, between the outer edges of the C6 and C7 vertebrae. Now use the fingers of your left hand to stabilize the skin. This prevents the skin from moving as you slowly pull to the right. Let your working finger slowly sink in to the tissue and then begin the motion toward the right, moving transversely through the fascial covering. After you reach the other side of the vertebra, switch hands and perform a fascial stretch in the opposite direction. If this causes too much discomfort, use a minute amount of moisturizing cream. After you've performed several longitudinal and horizontal strokes on the superficial fascial layer, you can begin to work on the deeper layers of fascia. Sink your fingers into the fascia a little deeper and remain there for 30 to 60 seconds before you begin any actual movement over the tissue. This time, exert a little more pressure as you move, and be aware of any resistance you encounter in the tissue. Whenever you notice some resistance, wait in that spot while maintaining the same level of traction without force until

the barrier softens and permits easier movement.

### **Intertransverse and Scalene Fascial Separation**

This technique can be performed with the thumb, middle finger, or index finger. Use whichever hand position and fingers are comfortable for you. Begin just beneath the mastoid process. Take a few moments to let your finger or thumb sink into the tissue. Use the other hand to gently support the head on the opposite side. Then press medially, toward the spine, as you begin your descent toward the shoulder. Whenever you feel a restriction, wait in that area, keeping your pressure constant, until you feel the tissue give way. Then continue your slow movement downward along the line of the transverse processes. You are working on the fascial coverings of both the scalenes and the intertransverse ligaments. When you reach the base of the neck, begin again, this time starting at the base of the neck and moving upward toward the skull. After you've performed several of these strokes, or after you feel the tissue resistance has sufficiently diminished, move on to horizontal fascial separation across the intertransverse ligaments.

Place your finger or thumb anterior to the transverse process, sink in, and move posteriorly. You may need to support the skin with the other hand in order to do this. Repeat this at every level. Then perform the same stroke from the posterior to the anterior aspect at each level. This is easier to do with the pads of your fingers than your thumb. Use the other hand underneath to support the skin if necessary. Ask how the person is experiencing each movement. One particular direction of fascial stretch may be more useful than another.

### **SCM Fascial Separation**

Rotate the head away from the side you are working on. Support and stabilize the head with one hand, and work with the other. You can use your thumb or the tips of your fingers, whichever you prefer. Begin behind the mastoid process at the major attachment of the sternocleidomastoid muscle. Sink into the fascial covering of the tendinous attachment before you begin to move. Then move slowly along the muscle in the direction of the sternoclavicular joint. If there are restrictions contributing to the person's neck problem, this technique will be slightly uncomfortable at various places along way. As you encounter a restriction, the movement will start to feel sticky, and it will be difficult to continue. Wait at that point, applying the same amount of pressure, until the restriction gives way. Then continue your slow movement downward. This movement can easily be performed at the posterior and middle sections of the muscle. To reach the medial portion of the muscle without accidentally applying pressure to the trachea, use your fingertips and apply your pressure laterally as you move down toward the clavicular attachment.

### **Upper Trapezius Fascial Separation**

Apply pressure with your middle three fingers at the base of the posterior neck on the trapezius muscles. Sink into the tissue and slowly move up the neck toward the occiput, pausing wherever you feel a restriction. This is a particularly pleasant motion for the client, unless there are

restrictions. You can do both sides simultaneously if there are minimal restrictions. Move posterior and lateral to cover the entire area, depending on the size of the person.

## **Massage Therapy**

### **Supine Dry Neck Massage: Warming up the Neck**

Because people are so sensitive in the neck region, it's a good idea to do a little bit of a warm up by massaging the neck muscles without any oil before beginning the friction or myofascial therapy on the neck.

#### **Transverse Erector Pull Through**

Place your middle and ring fingers at the center of the paraspinal muscles at the back of the neck at about the level of C4. With the right hand, move the skin over to the spine. Apply an anterior pressure as you sweep through the paraspinal muscles on the right side. Do this several times then repeat it at the same level on the left. Gradually move up toward the occiput and down toward the base of the neck, applying pressure in this way. Once you feel at ease with this, do it by alternating right and left hands at each level.

#### **Occipital Pressure Circles (Supine)**

To apply a pressure circle, do not move over the skin, or in this case, the hair. Make a small circle with light to mild pressure at first, moving along the base of the occiput to loosen up and relax the suboccipital muscles. Rotate the head to the left, gently supporting it with the left hand. Begin just medial to the mastoid process, and apply pressure with your middle, index and ring fingers toward the center of the head. Make a small circle three or four times, applying a medium pressure. Then move medially by half inch steps toward the occipital protuberance. Repeat on the other side with the other hand. If the person is fairly relaxed, you can work more deeply by placing your hand in the index finger supported position, performing the same technique with the tip of your index finger. If the person can handle the pressure, apply more force and hook your finger under the occiput as you perform this technique.

#### **Lateral Pressure Circles**

Using the same pressure circle concept, create a mild to moderate pressure with your right middle and index fingers. Begin just inferior and posterior to the mastoid process and perform pressure circles as you slowly inch your way down toward the shoulder, working on the scalenes just behind the sterno-cleido-mastoid muscles. Now work those muscles on the left. You can also do these on the right and left sides simultaneously if the client is not too sensitive here.

#### **Fingertip Pull**

Before performing this technique, tell the person that you're going to be applying some traction to their head and ask if that's okay. Of course, if the client is apprehensive or if this causes any dizziness or pain, do not perform this technique. Place your middle and index fingers in the

space behind the mastoid process, as if you were reaching under the occipital bone. Lean back and give a slight traction pull to the head in this way. Hold it for a few seconds and repeat three or four times. After you have performed your friction therapy to the neck, use massage cream or oil to apply massage to the neck and shoulder region to encourage circulation into this area.

### **Supine Posterior Neck and Upper Back Massage**

#### **Fingertip Sweeps (Together and Alternating)**

Apply some massage cream or oil to your hands and place your hands on the table on either side of the client's neck. Using your middle, index, and ring fingers, apply pressure with your finger pads at the junction of the neck and shoulders. With a continuous pressure move up to the occipital muscles. Begin at the lateral edges of the neck and work your way posteriorly. Repeat this movement a number of times and then do the same motion, alternating your right and left hands.

#### **Castanets (Continuous Fingers)**

With your fingertips at the base of the neck, roll through your finger-pads in a wave-like motion, beginning with your small fingers as if you were playing a pair of castanets, like this. Begin at the lateral edges of the neck behind the SCM and work posteriorly. Perform this motion simultaneously with your right and left hands, and then alternate between the two. If you want to make it a little deeper, use the fingertips instead of the fingerpads.

#### **Thumb Pad Down**

Hold the head with the left hand, and perform this technique with the right hand. Place your left hand under the neck so the head is elevated off the table, and place your thumb just below the occiput behind the sterno-cleido-mastoid muscles. Apply pressure with the thumb pad, sweeping down to the point of the shoulder. Be careful not to jam into the junction of the clavicle and acromion.

#### **Fingerpad Trapezius**

Grasp the trapezius muscles by hooking your thumbs anteriorly and roll through your finger tips as if you were playing castanets, apply an opposing pressure with your thumb. Begin laterally and move medially toward the neck. You can do the right and left simultaneously or alternate between the right and left.

## **Anterior Neck Massage**

### **Pull Through Sternos (Slow Pull Through)**

Using your thumb to oppose the lateral side of your index fingers, gently grasp the superior portion of the sterno-cleido-mastoid muscle. Slowly pull through the muscle in a transverse direction to the fibers and work your way down toward the clavicle until you're about an inch above the clavicle. Do this alternating right and left.

### **Sterno-Clavicular Attachment**

Place your fingers just inferior to the clavicle and your thumbs superior to the clavicle, about an inch lateral to the sterno-clavicular joint. This is where the extra slip of muscle attaches the SCM to the clavicle. Apply an inferior pressure to the superior clavicle. Massage laterally with your thumbs along the superior clavicle at the tenoperiosteal junction where the tendon attaches to the bone.

### **Underjaw Movement (At the Edges)**

Place your index fingers underneath the point of the jaw on the platysma and suprahyoid muscles bracing the anterior jaw with your thumbs on top. Applying pressure under the edge of the jawbone, gently pull back toward the ear. Stop at the back of the mandible when your finger touches the SCM. You can do these motions on both sides together or alternating right and left.

## **Prone Neck Massage**

### **Downstroke Side**

Apply a moderate amount of oil to the upper back. Standing at the head of the table with your hand open, place your left thumb at the nape of the neck just to the right of the spine. Place the right hand on the head, using a towel or tissue to keep the person's hair clean. This movement is done with the entire thumb. The other fingers rest on the back. Applying an inferior pressure, move along the top of the trapezius and supraspinatus muscles, leaning your weight into the thumb and keeping your hand open and relaxed. Don't push, or your hand will tire quickly. The movement finishes just before the juncture of the clavicle and the scapula. Be careful not to jam into it. As you perform this movement, you are applying an opposing force with the hand on the head, as if you were stretching the neck up and away from the shoulder. Remember to use pressure from the very beginning of the movement - don't build up to it as you go. Lean your body weight, instead of your finger strength, and remember not to press down on the client's head during the movement. When you reach the shoulder, relax your hand and drag back to the starting position without breaking contact.

## **Downstroke Diagonal**

Begin as you did in Downstroke Side, but now you're going to move diagonally across the trapezius in line with the medial edge of the scapula. Perform this movement with a slight pressure on the thumb point. Make sure you start high enough right at the base of the neck. With your hand open, lean into the thumb point and trace a forty-five degree angle to the spine. Be sure to stay slightly medial to the scapula - don't run into it. Use your body weight not your strength. The movement is finished when the thumb snaps over the edge of the trapezius muscle, which runs perpendicular to the movement. When you get to the end of the movement, relax your hand without lifting it, and drag it back to the starting position. To do this movement at a greater depth, place the other hand over it with your pisiform bone of your right hand on the back of your left thumb's thumbpoint. Lean in and repeat as before.

## **Downstroke Spine**

Starting again from the base of the neck, move along the lateral edge of the spine toward the inferior attachment of the trapezius. Using the thumb pad and the left thumb point, work on the left side of the neck and upper back. Begin the movement at the base of the neck, just lateral to C7, and slowly move down the erector spinae. Drag back along the same path, retracing your steps. If you experience any discomfort in your own thumb, support it by placing the other hand on top of it as you did in Downstroke Diagonal. Be careful not to hyper-extend your distal thumb joint.

## **The Bridge**

This movement works along the area of the spine and around the superior angle of the scapula. It targets the levator scapula muscle in addition to the trapezius, paraspinal and rhomboid muscles. Your hand will be in the bridge position. In this position, your finger pads are in contact with the skin and your palm is lifted into the air making a bridge shape between the first and second digits. In the bridge position, the fourth and fifth finger tips straddle the spine at the mid back. The thumb pad is positioned at the side of the spine in the groove between the spine and the erector spinae. Your thumb nail is facing you. From this position, move the thumb along the spine superiorly. The primary pressure is in your thumb pad. Allow your hand to collapse and flatten as it turns around the superior angle of the scapula. Continue toward the junction of the clavicle and scapula as you did in the Downstroke Side movement. Drag back, retracing your path, and ending with your palm as you began. The movement is performed slowly with light to moderate pressure at first, deepening as the muscles let go. If there is any discomfort in your thumb, use the other hand for support. Be sure not to hyper-extend your thumb.

## **Continuous Neck**

This is a gentle movement done early in the treatment to warm up the neck muscles or as a break between deeper movements. The practitioner stands at the level of the neck at one side of the table and works on the central neck. Both hands are placed in a C shape and, together, grip the

neck with the curve of the thumb in contact with the posterior part of the neck. Grasping the neck with both hands, draw the fingers and thumb toward the ceiling one hand after the other, squeezing the thumb and fingers together while pulling off the back of the neck. Don't allow the fingers to come to the front of the throat, and don't pinch off the back of the neck. Stop the movement when you still have an inch or so of the neck in your hands.

## **Deep Neck**

This movement focuses on the lateral and posterior neck muscles. The practitioner stands at the side of the table at the client's shoulder. During this movement, you are using two or three fingers opposing the thumbs, depending on the size of the person's neck. This movement begins like the Continuous Neck Movement. Move superiorly with deep pressure, scooping under the occiput with the footward hand. Move back to the central portion with light pressure and then move inferiorly with deep pressure, scooping under the trapezius with the headward hand. Return again to the center with light pressure, then deep pressure, and then with light pressure. Notice how you're using your own body. Since the movement is continuous, there is a tendency to compress your body when you focus on this small area. Make sure to maintain the length of your spine, especially your cervical spine.

## **Occipital Pressure Circles (Prone)**

Perform pressure circles in the prone position as in the supine position. Remember not to move over the skin, or the hair, or you will cause an irritation and an abrasion. Start out with light to mild pressure, moving along the base of the occiput on the suboccipital muscles. Begin just medial to the mastoid process. To work lightly, apply pressure with your middle, index and ring fingers. To work more deeply, use two and then one finger in the index finger supported position. Make a small circle three or four times. Then move medially by small increments toward the midline. Repeat on the other side with the other hand.

## **Neck Ligament Exercise**

Have the client lie supine with the neck supported by a pillow two to three inches in height. Ask the person to slowly rotate the head, without forcing it. Be sure the rotation is slow and not forced at the end of the movement. This movement is a combination of rotation, flexion, and side-bending. The pillow puts the neck in slight flexion so that the chin moves towards the shoulder on rotation without any extra effort. The result is slight tension placed on the cervical ligaments, preventing unwanted scar tissue adhesions from re-forming after treatment. Instruct the client to perform twenty-five rotations, right and left, two to three times a day. If the exercise causes any pain, it should be discontinued until the client has recovered more fully.

### **The Neck Relaxer Technique**

A great deal of muscle tension accumulates at the occipital region, for a variety of reasons. Stress is often a contributing factor. In addition, any injuries to the ligaments or muscles of the neck will cause the muscles' tendinous attachments at the occiput to go into chronic contraction. One way to get these muscles to relax is by applying sustained pressure to their attachments. That sends a message to the brain, through the mechanism of the golgi tendon organ, that there is too much tension. As a result, the muscles begin to release. By doing this for a few minutes each day, you can break the habitual neuromuscular pattern of contraction. The neck relaxer block is designed to do just that.

This wooden block is in the shape of a triangular prism approximately 3 inches high and 8 inches long. Each edge is constructed to exert different amounts of pressure: edge 1 is rounded, edge 2 is semi-rounded, and edge 3 is sharp. To use the neck relaxer, lie face up on the floor or a firm bed. Place the device under the back of your head at the lower occipital ridge, right where the base of the skull meets the neck. To begin, leave the rounded edge - edge 1 - facing up (If edge 1 is too uncomfortable, you can place a washcloth or towel over it to blunt the intensity of the edge. Later, when your neck muscles are more relaxed, you may discard the cloth.).

With your occiput lying on the rounded edge, rotate your head very slowly, first to one side and then to the other. While doing this, you'll probably find a few spots that are uncomfortable or painful. Let your head rest at each of these spots for ten to fifteen seconds, but never leave it in any one place for more than thirty seconds at a time. If stopping at the uncomfortable points is too painful at first, you'll probably find that a continual slow, rolling motion is easier to tolerate.

Once all the discomfort on the lower occipital line has been eliminated, move the block to the upper occipital line, about a quarter-inch higher. If there's no discomfort at this level, move it a little higher. When edge 1 no longer causes any discomfort, move on to edge 2, the semi-rounded edge. When this no longer causes any discomfort, move to the sharpest edge, which exerts the most pressure. Don't use this technique for more than four to five minutes at a time, or else soreness may develop. If that occurs, discontinue the use of the block until the soreness is gone.

The neck relaxer is a valuable tool for helping clients to reduce their own level of tension and keep the neck muscles in a more relaxed state.

## **Injection Therapy**

The treatment includes six basic steps.

Step 1. Valium.

Step 2. Xylocaine

Step 3. Manipulation.

Step 4. Proliferant.

Step 5. Exercises.

Step 6. Follow-up injections

## **DVD #5 - Case Enactment**

### **Post-Test**

1. If resisted extension of the elbow is weak, what structure is injured?

Answer: \_\_\_\_\_

2. True or False: The majority of chronic cervical pain is caused by injuries to muscles in the neck.

Answer: \_\_\_\_\_

3. Pain down the medial border of the scapula is most commonly caused by injury to what structure?

Answer: \_\_\_\_\_

4. True or False: Whiplash describes a specific injury in the neck.

Answer: \_\_\_\_\_

5. Injuries to the neck occur most commonly at which level of the cervical spine?

Answer: \_\_\_\_\_